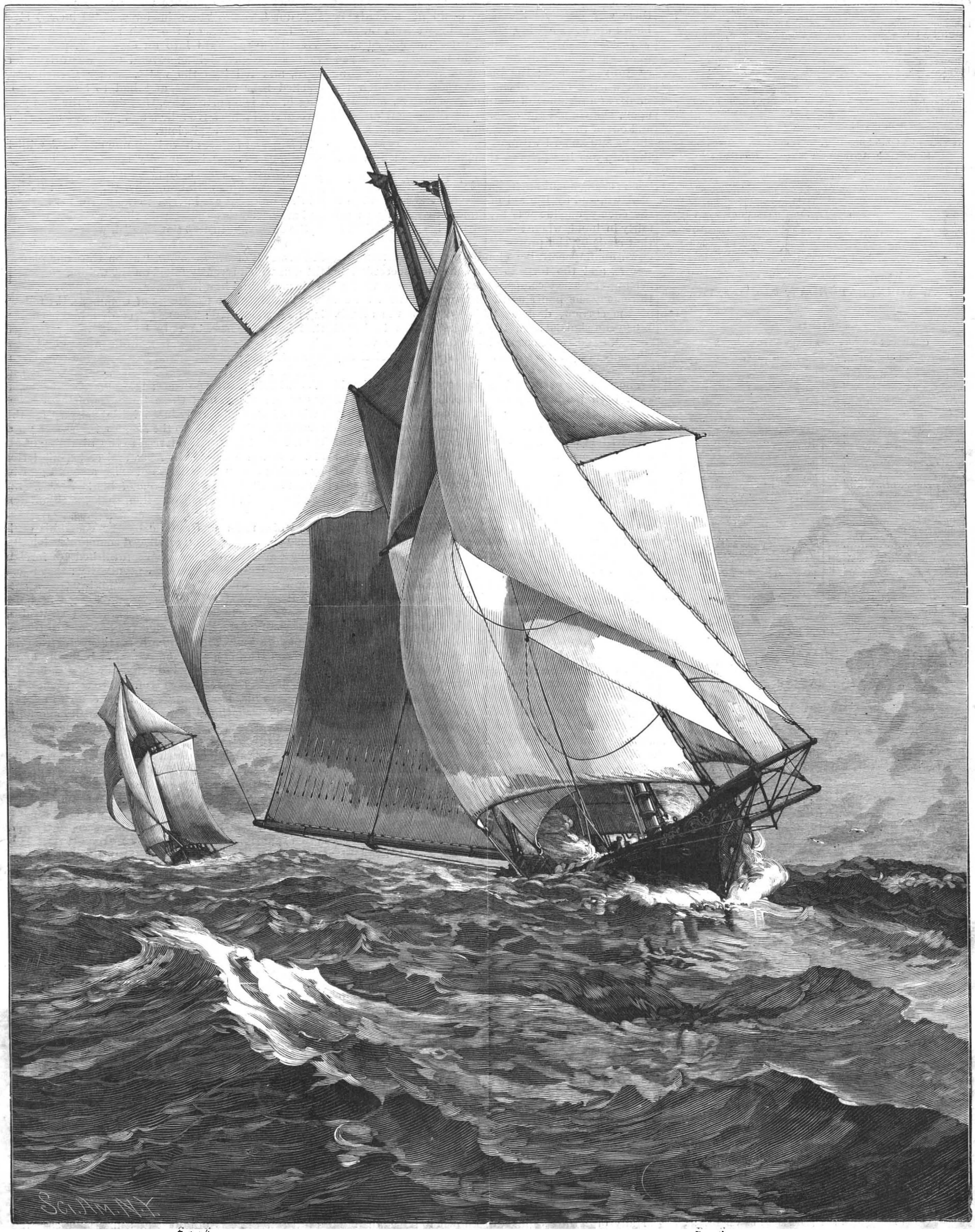
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LVI.—No. 14. [NEW SERIES.] NEW YORK, APRIL 2, 1887. [$3.00 per Year.



Coronet. Dauntless.

THE GREAT OCEAN YACHT RACE.—From a Painting by J. O. Davidson from Sketches at the Start.—[See page 218.]

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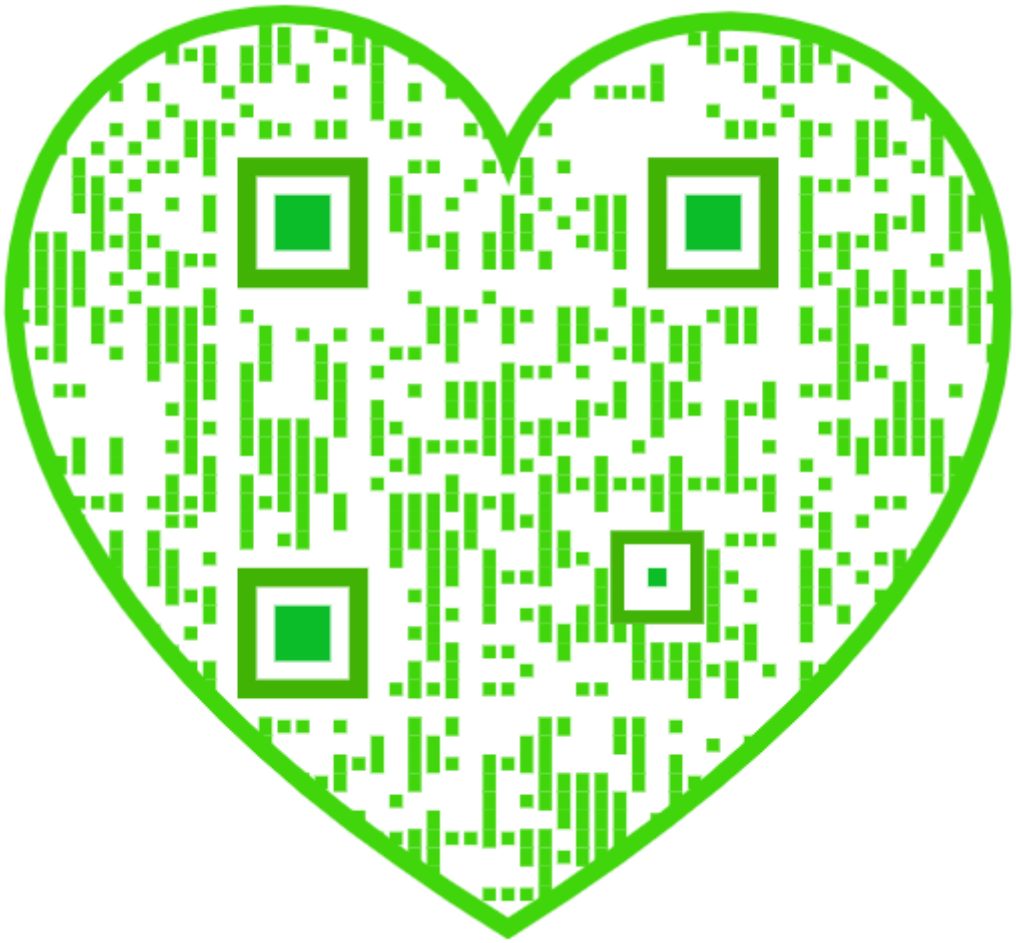

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, APRIL 2, 1887.

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SHAM FIGHTING SHAMS.

The sham sea fight now being arranged by the French naval authorities at Toulon will have an additional interest because of the controversy which followed a like engagement a year ago, when a Board of Admirals, acting as umpires, decided that the torpedo boats had won a victory over modern cruisers and great guns. The decision created no little indignation among the captains commanding the squadron engaged, not one of whom was willing to admit a successful attack on the part of the *flotte torpilleur*.

Last year's sham battle was brought on by an attempt by torpedo boats to destroy or disperse the squadron blockading Toulon, under cover of which several fast cruisers, detained in the port, were to make their way out. As the ships could not actually be blown up, nor shell nor shot be thrown from the land works or the shipping, certain rules were agreed upon to decide when a ship or torpedo boat had been successfully attacked; the Board of Admirals deciding that when a torpedo boat was sighted through the smoke at a distance of one hundred meters, and fired upon, she should thenceforth be considered disabled and out of the fight, while, on the other hand, should she be laid aboard without that the enemy saw her, the ship was her prize as though destroyed by a torpedo.

The engagement opened at 2 A. M., at the first sign of dawn, and by the aid of his electric search lights the enemy outside was beginning to get his ranges fairly in hand, when the smoke of his guns, added to that made by the protecting shore batteries, brought down an impenetrable cloud upon the surrounding waters, and the torpedo boats, having succeeded in getting the exact compass bearing, each one that of the enemy she had singled out, together with the set of the current, dashed boldly out to the attack. When the signals from the judges' station indicated that all hands were engaged the fast cruisers, waiting with steam up for a chance to escape, sped noiselessly out.

The French commanders insist that they should have been permitted to use torpedo boats to beat off the hostile torpedo boats; and, further than this, they say that even if the torpedo boat attack was successful, the fact should not have been made public, for that it only serves to dishearten the sailors, who, let them once believe in the effectiveness of torpedo boat attack and the vulnerability of their ship, and their efficiency in time of action is sure to be seriously lessened.

This view seems, also, to be shared by the English naval authorities, who last summer, at Milford Haven, arranged a naval battle with, apparently, the single purpose of showing the bluejackets how futile is the resistance of torpedo boats to modern ships. A great boom of logs supporting heavy chains was stretched across the mouth of the harbor, and inside, presumably to protect it, a fleet of torpedo boats were gathered. The big Polyphemus, under full head, made a dash for the boom, forced it below the surface, and rode over it. Then was affixed a torpedo which tore it apart, and the enemy, in column, sailed triumphantly in.

But supposing the torpedo boats had not been carefully cooped up inside by the boom, but permitted to go out to the attack, which is their purpose—if they have any—might they not have interfered somewhat seriously with the procession?

There is reason to believe that, when the time for real work comes, the torpedo boat will prove a great surprise to the sham fighters.

THE NEW GUNS FOR THE NAVY.

By the acts of Congress approved August 3, 1886, and March 3, 1887, the sum of $3,120,362 is available for armament of the new vessels of the United States Navy, the monitors, cruisers, and others. The acquisition of the largest and most powerful guns made is contemplated in the granting of these appropriations. The question arises, therefore, What type of gun should be chosen? If we look abroad for a model, the heavy artillery of England, Germany, or France at once are suggested. The works of Armstrong and of Krupp, and the French establishments at Ruelle, St. Chamond, and Le Creusot, present themselves as the great gun factories of the world. Their names seem to guarantee the quality of their product. Basing their qualifications largely on the material used by these producers, the authorities of this country have called for steel of certain definite strength and ductility. The tendency is inevitably to be guided by European practice.

But criticism of this method of dealing with the question is not wanting. Facts that seem undeniable are cited which go to prove that the construction of large guns is not yet perfected. If this is true, it would suggest a field for independent work by the ordnance authorities of this country. We hardly seem justified in following blindly the lead of foreign constructors. The successful gun of the future may yet be an American production.

Many of Krupp's guns are known to have failed in war use. In the British House of Lords on April 30, 1876, the following statement was made by the Duke of Cambridge, Commander in Chief of the British Army: "Out of seventy heavy guns employed against the southwest of Paris (by the Germans), thirty-six were disabled during the first fortnight of the bombardment by the effect of their own fire." It is said that during the Franco-Prussian war two hundred Krupp guns burst, and that the German commanders thought that a week's further resistance by the French would have silenced the batteries bombarding Paris, as the attacking guns would have become disabled by their own discharges. The Italian government has rejected two of Krupp's 100-ton guns, after trying them at Spezia.

From France, similar accounts are received of the behavior of their ordnance under more recent trials. On June 4, 1884, a 24-centimeter (9 45-100 inches) steel gun burst at Havre on the fifth round. The breech was driven backward into an earthwork at the rear, while a portion weighing several tons was driven forward, and fell into the water. Other French guns cracked near the muzzle, and had to be reduced in length. It is reported, also, that during the past year several steel guns have failed, and produced disastrous accidents in their explosions.

In England failures have been numerous. A million of pounds sterling is annually spent upon artillery. Yet *Engineering*, one of the leading English technical journals, speaking of the English artillery says: "After all this, our guns are inferior to those of other nations, and are nearly as dangerous to those who fire them as to the enemy." In 1886 the English were making five 110-ton guns, eighteen 66-ton guns, and six 43 ton guns, in the words of *Engineering*, "all on the same plan as the gun which recently failed on the Collingwood with little more than half its proper charge of powder."

In last March, in the House of Commons, the following facts were cited: To one ship orders had been sent that her guns should only be fired under reduced charges; on another ship, out of nine guns, eight were unserviceable; an 80-ton gun had been sent home from Gibraltar to be repaired; a 9-inch 18-ton gun burst at Woolwich in testing powder; 135 guns were made on one plan, and seven of these burst, requiring a lower rating of charge and reduced initial velocity for the remainder. In a letter to the London *Times* last year, Capt. Robert H. Armit referred to the disabling of all of the 38-ton guns on the Ajax, and ended his letter by stating that "there does not exist a sound gun in the service." This was only one of his letters. So far had he gone in his condemnation, that an injunction was applied for by the makers of the guns, to restrain him, which relief was refused by the court, his criticisms being held to be "privileged communications."

These are some of the lessons furnished by foreign practice. They all possess one peculiarity: they teach us how "not to do it." But we cannot say that a successful and final type of heavy gun has yet been developed. The built-up guns are subjected to strains, molecular and mechanical, that tend to their ultimate disorganization. The powder heats the metal from the interior, expanding the tube and inner rings the most. These expand, not only radically, but longitudinally. On cooling, great resistance is offered to contraction by friction, so that a permanent injury is caused in many cases. The continual expansion and shrinkage have an inevitable tendency to disorganize the whole piece. The theory of the strength of a gun teaches that the metal nearest the bore does the most work in resisting the effect of the discharge. The useful effect of the metal, according to Professor Barlow, varies inversely with the square of its distance from the longitudinal axis of the piece. Thus, the outer layers do comparatively little, and should be, if anything, the softer and more expansible metal. To be of any effect. these layers should be in intimate contact with the inner. This statement would indicate a source of weakness in re-enforced guns. A ring shrunk on may be in such a state of tension as to be ready to part, yet its connection with the tube or ring below it is not as intimate as if it were part of the same metal.

As remedies for these evils, different cures have been suggested. Soft steel of low tensile strength is advocated by one engineer. Such steel is incapable of taking a temper, and is really wrought iron. It is naturally free from many of the defects of the higher steels. The latter crack more readily, and have not the lead-like toughness of the milder metal. The lower tenacity called for seems a defect, but it is used as the index of the quality. A tough, weldable metal is inevitably of lower tenacity, and in defining this the other qualities go with it. A more radical remedy is proposed by a second engineer. He advocates the abandonment of all steel and the adoption of cast iron. This sounds like a step backward. Yet he fortifies his position with so many instances of what cast iron guns have done, that it is hard to resist the conclusion that they are at least worthy of a more extended trial. Their rifling may need special study, as the wearing of the bands has been one of their weak points. Other details may have to be worked up. But when it is considered that an integral piece is obtained at a minimum cost, the subject seems worthy of trial.

Some aluminum compounds could well be experi-

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mented with. The mitis castings might afford a good basis for work. Enough has been shown to indicate a good field for inventive genius, to which we hope our government will afford every encouragement. All we wish to suggest is that the field is still open for exploration; that, according to all accounts, the perfect gun has not yet been produced.

Black Birch an Ornamental Wood.

Three years ago, the writer built a dwelling house in the country. In selecting the woods for the interior of the house, his attention was called to some doors the builder, Mr. P. B. Fairchild, of Orange, N. J., had put into a house he had just finished for himself. Remarking that I had never seen black birch used before in the inside trimming of a house, but that I liked its fine grain and the handsome color of the wood, I decided that I wanted birch used at least in one of the rooms of the house about to be built. Mr. Fairchild thought the architect might object to its use, as it was not a wood much known to the trade; and then he related how he had selected it from a lot of odds and ends of lumber lying about his shop, more to get rid of an unsalable article than for its appropriateness or its beauty, and, that his new house was built principally out of odd lots of stuff which had been accumulating for a long time about his premises.

Subsequently, an interview with the architect resulted in getting him to go and see the house finished with birch doors and trimmings, which he admitted looked very well; but then he had never heard of birch being used before for any such purpose, and he had grave misgivings as to the result of the experiment if the birch was adopted. But without further argument, the architect consented to a trial of the new wood, and it was introduced into the wainscoting, doors, and fireplace of the dining-room, and it resulted most satisfactorily to all the parties having a voice in matter—the architect, the builder, and the owner.

Persons who may not know the nature and color of black birch after dressing and polishing may be interested in knowing that the grain of the wood is very close, the color mottled and slightly darker than satinwood. Black birch makes beautiful furniture, and the only complaint made against it for house trimmings is the care and extra time required in nailing the boards, to prevent splitting.

The above incident was brought to the writer's mind from seeing in a Western newspaper devoted to the lumber interests the following:

"The price of black birch of best quality has recently gone up from $7 to $95 per 1,000. The extraordinary advance is due to the discovery that boards cut out of the first logs are susceptible of a very high polish, and can be used for almost any purpose hitherto exclusively reserved for mahogany, which is worth about $250 a thousand. The advance has been expedited by the discovery that the best black walnut is giving out. Black walnut from Arkansas and the South is so porous that it is of very little use in furniture making. The best black birch is found almost exclusively on the barren copper and ore regions between Marquette and Ashland, where all other timber is stunted in growth and very poor. Here boards cut out of the butt, quickly assume a beautiful red tint on being exposed to the atmosphere, and can be polished up to a great degree of fineness."

Navigation of the Suez Canal at Night.

Art. 1.—From the 1st of March, 1887, and until further orders, steamers may be permitted to navigate the canal at night under the same conditions as are in force for navigation by day, and subject to the following regulations:

Art. 2.—Steamers intending to go through the canal at night must first satisfy the agents of the company in Port Said or Port Tewfik that they are provided—

1. Forward with an electric "projector," throwing a light 1,200 meters ahead. This projector must be placed as near as possible to the water line.

2. With an electric lamp and shade suspended above the upper deck, and powerful enough to light up a circular area of about 200 meters diameter.

The agents of the company will decide whether the apparatus fulfill the requirements of the regulations, so that ships provided with them may, without inconvenience, be authorized to navigate the canal at night.

Art. 3.—If a vessel, navigating by night, is ordered to get into a siding, she must, immediately on having done so, put out her electric lamps; but she must carry exclusively the regulation lights when in a siding at night, viz., forward and aft a white light, and a man on the lookout.

On the nearing of tugs, steam launches, hopper barges, etc., or of a ship empowered to pass her, she must show the side for free passage by exhibiting on such side two white lights.

Art. 4.—When two or more ships having electric lights are navigating at night in one and the same direction, and any one of them stops, she must at once hoist a red light at her mizzen-mast head, sounding at the same time her steam whistle sharply three times in close succession, repeating this at a few moments' interval until the ship following her repeats this signal, which shall be taken as an order to slacken speed at once, with a view to stopping, if need be.

Art. 5.—Dredges working at night must carry a red light at their head as long as they are not in a siding.

Art. 6.—As soon as a ship navigating by night finds herself three miles from a dredger at work in the canal, she must signal her approach by sending up three rockets in succession. This signal must be repeated until the dredger has replied. The dredger must reply with one rocket. As soon as the dredger is in the siding, she must replace the red light at her head by a white light, and place two additional white lights on her bulwarks on the channel side.

Dredges lighted by electricity must extinguish all their electric llghts as soon as they are in a siding.

Art. 7.—The signals from sidings to ships navigating at night will be as follows:

1. Slacken speed.—Three white lights one above the other.

2. Get into the siding.—Two white lights one above the other.

3. Pass on.—One white light.

When the above signals are intended for a ship coming from the north, a fixed red light will be shown above them. On the contrary, this red light will be placed below them when intended for ships coming from the south. FERDINAND DE LESSEPS,
President-Director of the Suez Maritime Canal Universal Company.

Heating Cars by Gas.

In applying his skill to the heating of railway carriages, Mr. William Foulis, M. Inst. C. E., the manager in chief to the Glasgow Corporation Gas Commissioners, takes advantage of the fact that large numbers of them are already fitted with various forms of gas lamps for supplying light; and his aim has been to bring the heat that is developed in the roof of the carriage while the gas is alight down to the floor of the compartment, so as thereby to keep the feet of the passengers comfortably warm, and the whole atmosphere of the compartment at an agreeable temperature. He uses water as the medium for transmitting the heat of the gas flame from the one place to the other. A boiler is placed in the roof of the carriage over the flame of the gas lamp. It is of very simple construction, and the principle on which the heater works is that the heat from the flame comes into contact with the boiler at the point where the water is hottest and leaves it where it is coldest. From this boiler there descend two pipes about ¼ inch in diameter, which are connected to two annular tubes placed underneath the carriage seat. The course which the two pipes take is down through the wooden partition separating the contiguous compartments. Hot water circulates through these pipes and annular tubes, and it returns to the boiler after having given off its heat. The reversal of the current is accomplished by allowing the hot water from the boiler to ascend in a tube a few inches in length, on the top of which there is a small valve. Having passed up this tube, and being unable to return to the boiler, the hot water is made to circulate downward through the pipes. The annular tubes already referred to are about 3½ inches in diameter and about 8 inches long. They are laid at an angle under the seat, the upper end being raised as far as practicable. The pipe which conveys the hot water is connected to the top of these tubes, and that which carries the return current is connected with the bottom of the same.

Owing to the fact that the tube is placed at an angle and that it is heated, an induced current of air is made to pass through it; and as the air enters the tube at the cold end and leaves it at the hot end, it absorbs the maximum amount of heat from the water. The air flows from these tubes or heaters in a constant stream at a temperature of from 80° to 90°. It has been found that the ordinary size of gas flame is quite sufficient to do the heating of a compartment, though the consumption of gas is less than one cubic foot per hour, and even during the coldest days of winter.

As regards the probability of the water in the apparatus freezing in cold weather when the carriage is not in use, it should be mentioned that congelation is completely prevented by mixing a given quantity of glycerine with the water. By way of testing the efficiency of this non-freezing mixture, the experimental carriage which has been placed at the service of Mr. Foulis was left exposed at night on a railway siding during the coldest weather of the past winter, without the slightest indication of freezing taking place in the water to which the glycerine had been added.

We may mention that the carriage used is a composite one of four compartments, the property of the Glasgow and Southwestern Railway Company. The internal construction of the carriage was entirely rearranged under the superintendence of Mr. Foulis. During the past two months or so, numerous experimental runs have been made with this carriage as part of a regular passenger train, several of them being to and from Carlisle. On one or two occasions the patentee has been accompanied by Mr. Smellie, locomotive engineer, and other leading officials of the Glasgow and Southwestern Railway Company; and in all cases they have expressed themselves as highly satisfied with the results achieved by Mr. Foulis. The present writer had the pleasure of joining in one of the runs from Kilmarnock to Carlisle and back, when the weather was wintry in the extreme, all the hills for many miles being covered with snow. Inside the carriage the temperature was most agreeable, and in marked contrast to the outside. A thermometer hung in the compartment, in which there were only three persons, never fell below 52°, and the extent of the range was only 2°. On other occasions the temperature ranged from 56° to 60°.

Of course, in carriages heated on the "Foulis" system the gas must be constantly burning—by day as well as by night; but if heating for the comfort of the passengers is to be done, it matters not though the heat is obtained from a luminous flame, provided that it is comparatively inexpensive. In this case it is remarkably economical, while as soon as darkness sets in the gas flame does double duty, providing both heat and light. What could be more absurd than the idea of carrying gas in tanks on the cars, to warm a railway train, and what a funny idea of comfort it is to ride in a close compartment, fouled by gas jets, with a chilly temperature of 52°! *Engineering*, however, says: So far as can be seen at present, it must be unhesitatingly declared that Mr. Foulis has made a most important invention; and much credit is due to the directors of the Glasgow and Southwestern Railway Company for giving him facilities to enable him to bring it to its present perfect stage.

Zenas Crane.

The Dalton, Mass., Paper Mills have, for more than a generation, been among the most prominent in the country for the variety of high grade stock they turned out, under the proprietorship, and largely from the personal direction, of Zenas M. Crane, who died on the 12th ult. of apoplexy, aged 72 years. Besides fine stationery and parchments, the mill were particularly distinguished for their bank note papers, of which they made all the kinds used by the United States and several foreign governments. To Mr. Crane is attributed the idea of first introducing into the fiber of bank bills numbers corresponding to their value, to prevent the fraudulent raising of their denomination. He is said to have been dissuaded from patenting this idea, at least he never did do so; but as it was largely adopted afterward, both here and abroad, his failure to obtain a patent thereon probably causes the considerable fortune he leaves to be much less than it otherwise would have been. The deceased leaves a widow and five children.

The French Exhibition.

In its capacity as official gazette of the Exhibition of 1889, *Le Genie Civil* gives many interesting indications of the character of the future exhibits. Among other things, an historical exhibit of methods of artificial lighting is to be prepared, showing the progress of this great modern art from the rush-light and the pine-knot torch to the first-class electric lighthouse lanterns of the present day. The buildings and grounds of the Exposition itself will furnish a striking example of the present state of the science of illumination at its height. It is decided that the main exhibition building, including the whole of the Champ de Mars, shall be fully lighted every night, leaving the palace of the Trocadero to be illuminated only by lines of exterior gas jets, as a pretty object to close the perspective view across the river. So far as the buildings themselves are concerned, everything is already being pushed to the utmost. The enormous structures of the Champ de Mars, with their roofs of two hundred and fifty feet span, are to be ready for beginning the setting of the glass roofing on the first day of next July, and in a few days the seed will be sown, in a reserved portion of the Parc aux Princes, which is to furnish turf for the *pelouses* of the Champ de Mars and the Trocadero garden. Hitherto, the grass intended to beautify the grounds about exhibition buildings has usually been either a scanty vegetation, raised on the spot from seeds sown a few weeks before, or a fictitious turf, produced by Mr. Olmsted's clever device of sowing rye and keeping it closely mown; but the Paris grass of 1889 will be cultivated by itself for two years, until it has formed a close, well-rooted sod, and will then be stripped off and transferred bodily to the place intended to receive it.—*Amer. Architect.*

Industrial Exhibition at Worcester, Mass.

There is now open in Worcester, Mass., at the Rink, a splendid industrial exhibition, which attracts much attention. Space and power are free to exhibitors. It is under the auspices of Mr. H. B. Bigelow, and remains open until the middle of April.

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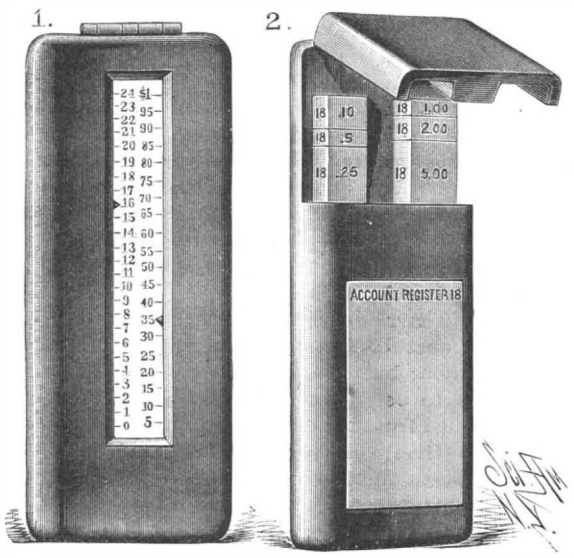
IMPROVED ACCOUNT REGISTER.

This device is adapted for use in the keeping of accounts between a storekeeper and his customer. The case is arranged to receive and hold two sets of checks, one representing dollars and the other fractional parts of a dollar. The thickness of the checks varies in accordance with the amount which they represent—as, for instance, the ten cent checks are twice as thick as the five cent ones, while the twenty-five cent checks are five times as thick. Each set of checks is passed upward by a spiral spring, above which is placed a block carrying a pointer ranging along a scale as shown in Fig. 1. As goods are bought, the checks representing their value are removed from the case, and pointers will then show the exact amount the customer owes in dollars and cents. For instance, Fig. 1 shows that $16.35 have been taken out. The slate of celluloid inserted on back of Fig. 2 is for use to write orders or make out bills upon.



BENHAM'S ACCOUNT REGISTER.

This invention has been patented by Luther Benham, of Marianna, Arkansas.

IMPROVED NUMBER AND LETTER PLATE.

This number and letter plate is simple in construction and durable, and can be easily and securely attached to doors, etc. The letter plate consists of one or more plates formed on their fronts with numerals or letters, and of a dovetailed bar, Fig. 4, fitting into a corresponding groove, Figs. 2 and 3, formed on the back of each plate, which may be made either solid or box-shaped, with an open back. The bar is held to the door by screws passing through its ends. The sidewise movement of the several plates is prevented by a washer placed between each screw head and the bar, part of the edge of the washer fitting snugly against the edge of the plate. If desired, the head of the screw can perform the same function as the washer. The bar is made of varying lengths, to suit the number of plates to be united to form the required number or name.

KIMBALL'S IMPROVED NUMBER AND LETTER PLATE.

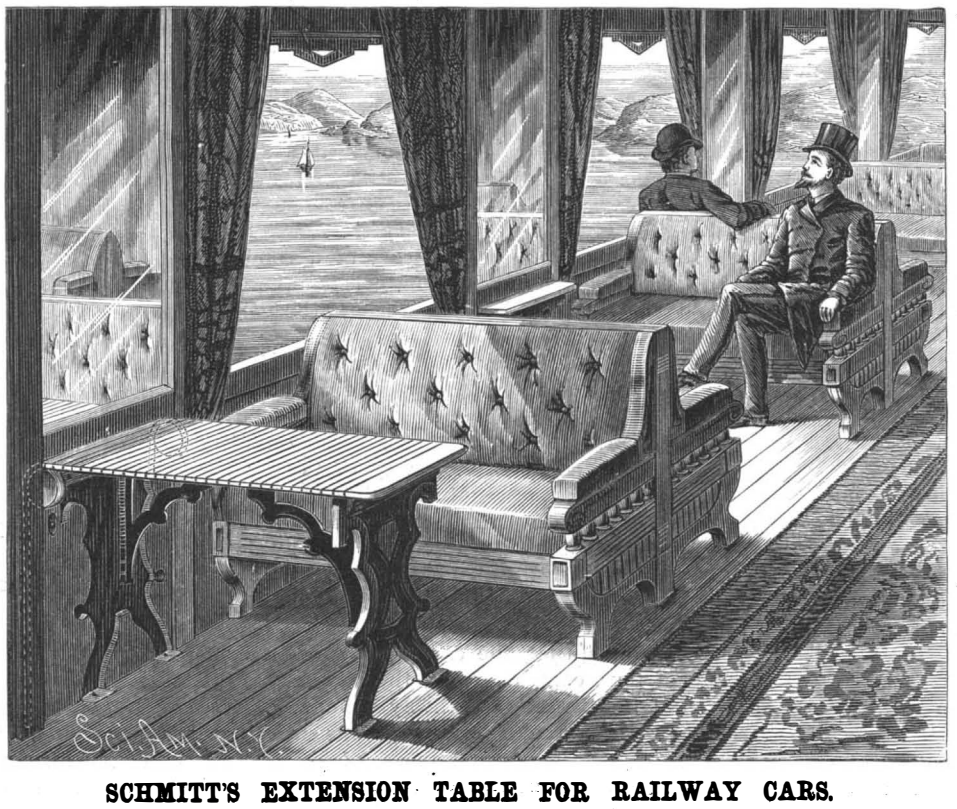
This invention has been patented by Mr. H. Z. Kimball, of 416 Bedford Avenue, Brooklyn, N. Y.

EXTENSION TABLE FOR RAILWAY CARS.

This extension or folding table is adapted for use at the side walls of railway cars, boats, rooms, or at the sides of house or office furniture, such as bureaus or desks. As shown in the engraving, the table is designed to fold partly against and partly within a hollow side wall of a car. The wall of the car next the floor is made hollow to provide an inner space, at the top of which is journaled a roller, over which the flexible part of the table top passes. The top consists of slats glued to a flexible backing. The outer portion of the table comprises a shelf fixed to an ornamental leg provided with a ring or knob for drawing the table out fully into position for use. On the bottom of the leg are a roller and a couple of pins, which do not touch the floor when the leg rests on the roller; but when the table is drawn out the roller enters a recess, and the pins drop into holes in the floor. The pins prevent sidewise movement of the table, which will be thus held steadily. To the face of the wall is journaled suitably, on a vertical axis, a bracket, on which is fitted a spiral spring held at one end to the wall and at the other end to the bracket.

This spring acts normally, when the table is extended, to automatically swing the bracket outward beneath the top of the table; and as the table is pushed or folded, the bracket will be folded flat and in between the leg and wall, as the flexible top runs back over the roller and passes downward within the space in the wall. The slat at the free end of the top is a little longer than the others, to prevent the top from being drawn entirely from the opening. When the table is folded, the top and bracket are concealed from view, and the shelf may be utilized for holding various articles. It is evident that the table leg may be ornamented to correspond with the wall or piece of furniture to which it is connected.

This invention has been patented by Mr. George Schmitt, care of Delmonico's, Fifth Avenue and 26th Street, New York City.



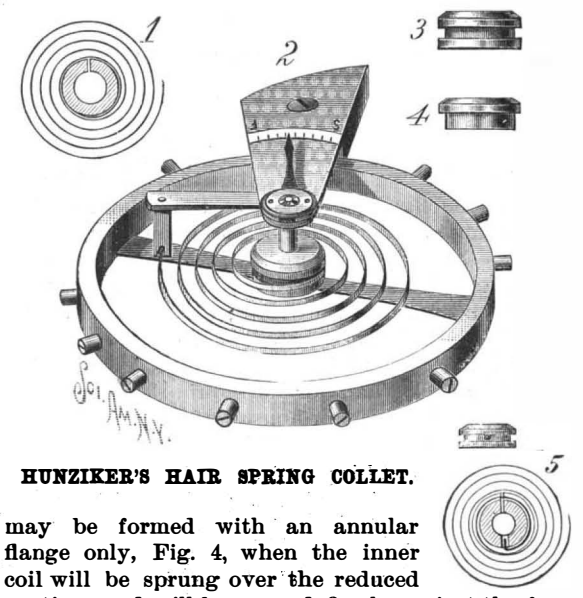
SCHMITT'S EXTENSION TABLE FOR RAILWAY CARS.

Cemented Ships.

Portland cement has often been described as the very life of an iron or steel ship; and considering that, as a rule, the tendency to wear and tear from corrosion is much greater on the inside than on the outside of their plating, the substance in question is, says the *Engineer*, fairly deserving of the confidence reposed in it. If the cement is good and well looked after, the inside surface of the plating from bilge to bilge can suffer no injury whatever from the usual acid water lying in the limbers. Ships have been known to "float upon their cement," one case in particular being that of an old passenger steamer, which when examined in graving dock by striking the bottom with a hammer, yielded so dead a sound at one place that a closer inspection was made, revealing the unlooked for fact that cement and not iron was being struck. The bottom plating was, indeed, wholly wasted by corrosion at the place which was struck, but so hard was the cement that only by many and vigorous blows was it broken. But cement was cement in those days, and not the adulterated mixture one sometimes comes across in this degenerate age. Moreover, sharp, fresh-water sand was used in mixing such cement as that, and not the dirty saline substitute now too commonly employed.

HAIR SPRING COLLET.

Since 1658, when Dr. Robert Hooke, of London, invented and applied the hair spring, or balance spring (then termed pendulum spring), there has been no improvement made in the manner of fastening them to the collet. It was then, and is yet, performed by inserting the inner end into a hole drilled diagonally through the wall of the collet, and then wedged by means of a small pin. By this operation the collet would take the position that the pin or wedge had, and the inner end of the hair spring would force it to one side and make it eccentric. And as the time-keeping qualities of any time piece having a balance and hair spring depend upon the isochronal vibrations of the spring, it was necessary to bend the inner end of the spring in such a manner as to make the spring and collet concentric. This required both skill and time, and was not perfect at best. The recent invention here illustrated consists of a collet with a groove turned circularly in it the exact width of the spring and as deep as the thickness of the spring, as shown in Fig. 3. The inner coil of the spring is then sprung into this groove, which holds it absolutely central and parallel with the plane of the collet by its tension or contracting force. The collet may be formed with an annular flange only, Fig. 4, when the inner coil will be sprung over the reduced portion, and will be pressed firmly against the face of the flange. In soft springs, the inner end is inserted in a hole drilled diametrically through the wall of the collet, as shown in Fig. 5. Hardened springs hold sufficiently by the tension of the coil with the inbent inner end.

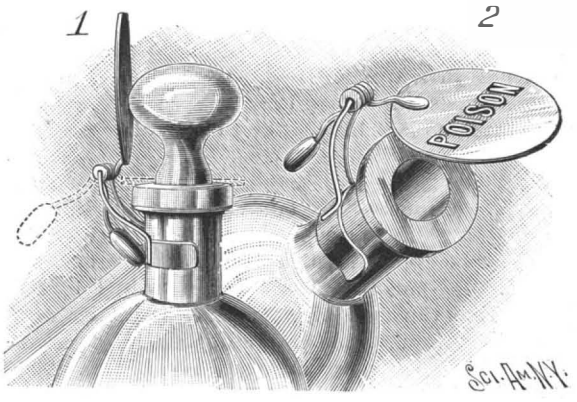


HUNZIKER'S HAIR SPRING COLLET.

This invention has been patented by Mr. Edward Hunziker, of 64 Nassau Street, New York City.

BOTTLE ATTACHMENT.

The object of this invention—which has been patented by Mr. J. F. Herbert Sugg, of Sabula, Iowa—is to prevent mistakes in dispensing medicine, by bringing before the eyes of the druggist a movable label, which will notify him of the nature of the contents of the bottle. Embracing the neck of the bottle is a spring clip, provided with a wire loop, upon the middle part of which is loosely pivoted a lever, formed of a wire bent spirally at its center, to form a spiral spring, which is placed on the loop. The ends of the lever extend in opposite directions, and one is secured to a plate marked with the word "poison," while the other carries a counterweight. The plate and weight are below the fulcrum, so that the lever is always in a state of stable equilibrium when the stopper is removed; and thus, when the bottle is tipped, the lever will maintain its position and allow the contents to be poured out. When the stopper is in the bottle, it holds the spring under tension, and the plate then stands vertically and presses against the stopper. When the stopper is removed, the plate is thrown forward over the mouth of the bottle by the spring. The sharp click of the plate striking the bottle calls attention to the word "poison," and, if the bottle remains in a vertical position, the plate will continue to cover the mouth and display the warning word. Should a mistake be made in dispensing the contents of the bottle, the druggist will be notified of it when he attempts to return the stopper, as the plate will be in the way, and must be removed before the stopper can be inserted. This attachment will also prevent drinking from the bottle in the dark by mistake, as it will interfere with the direct use of the bottle in that way.



SUGG'S BOTTLE ATTACHMENT.

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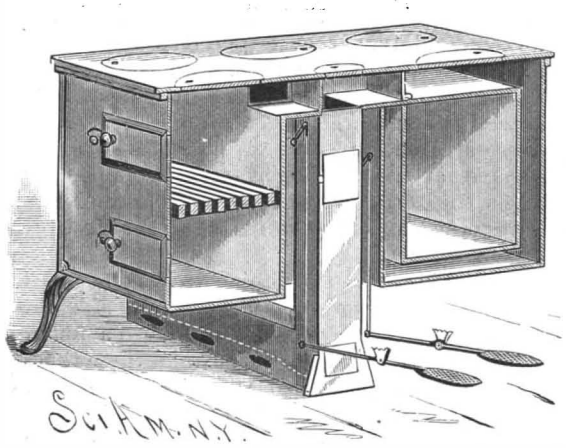
IMPROVED STOVE.

The accompanying engraving represents a stove, one-half being cut away in order to show the interior, constructed to form a fire box, three ovens, and the central main outlet flue. Within the stove are suitably arranged passages and dampers, by means of which the heat from the fire may be guided so that all of the ovens, or any one or none of them, may be especially heated. The rods by which the dampers are operated extend to the outside of the stove, within convenient reach. This stove is economical in the use of fuel, as the products of combustion, passing from one oven to



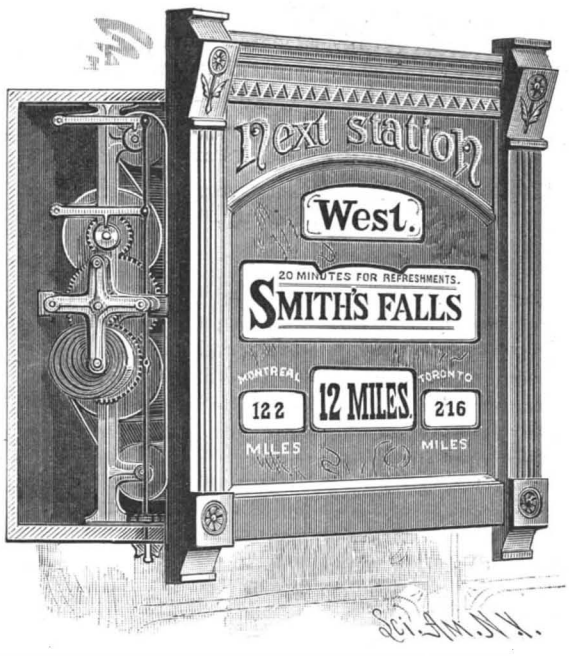
BEKOFSKY'S IMPROVED STOVE.

another, are retained a long while in the stove, so that all the available heat is utilized. The convenience of having several separate and independent ovens in each of which the degree of heat can be regulated as required is apparent.

This invention has been patented by Mr. Vladimir S. Bekofsky, Isaakiefsky, Pl. N. 6/8, care Restaurant, Mrs. Michel, St. Petersburg, Russia, who will furnish all further particulars.

STATION INDICATOR FOR CARS.

This practical mechanical device is for indicating the stations on railway trains, and giving other information—such as the distance between stations, the direction the train is going, etc. The box or case is placed at any appropriate part of the car, so as to be seen by the passengers. On the front of the box the words "Next station" are painted, below which are slots, as indicated in the engraving. The names of the



CURRIE'S STATION INDICATOR FOR CARS.

stations and such other information as may be deemed necessary are printed upon a ribbon, placed close to the inner surface of the front of the box. This ribbon is wound upon suitable drums, journaled within the box, which are adapted to be revolved by a coiled spring acting through suitable gearing. The center gear is so arranged that it can be shifted to mesh either with the next upper or next lower wheel. When it engages with the upper wheel, the upper drum will be revolved in a direction to move the ribbon up; and when it engages with the lower wheel, the lower drum will be revolved to move the ribbon down or in the reverse direction. Suitable levers, engaging with notches formed in the rollers, insure the stopping of the ribbon in the proper position to display the words at the slots in the front. To start the machine in motion, these levers are lifted simultaneously by means of a rod to which their free ends are attached. When thus raised, the machine starts instantly, so that the finger piece on the lower end of the rod need be held in an elevated position only for an instant. The machine will continue to run until the points on the levers enter the notches in the rolls. It is evident that the center gear wheel need only be moved at the end of the route, when the car will travel back over the road in the opposite direction. At each movement of the ribbon, a bell is struck to attract attention to the indicator.

This invention has been patented by Mr. William W. Currie, of Smith's Falls, Ontario, Canada.

Measuring the Bulk of Solids.

Mr. Klumann, of Halle, has devised a simple and easily constructed little apparatus for measuring the bulk of a solid body without immersing the latter in water and without weighing it.

The instrument consists of a graduated glass tube, 1 in. in diameter, which is closed at the upper extremity with a rubber stopper, while the lower extremity is fixed in a copper box, 2¼ in. in height and 4 in. in diameter.

The apparatus is filled with sand up to the zero of the graduation. Then it is turned upside down and the bottom of the box is unscrewed, and the object inserted. After the box has been closed, it is placed in its upright position. It is then only necessary to observe the level of the sand in the tube. The volume sought for will be read upon the graduated scale.—*Chronique Industrielle.*

Cutting Glass Tubes by Electricity.

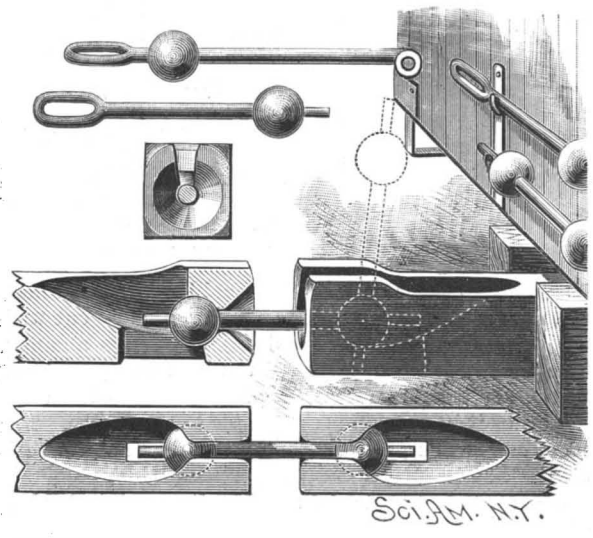
Mr. Estere, of La Reoli, describes in *La Nature* the following process of cutting glass tubes of wide diameter by means of electricity:

The tube is surrounded with a fine wire, and the extremities of the latter are put in communication with a source of electricity. It is necessary to see that the wire adheres closely to the glass. When a current is passed through the wire, the latter becomes red hot and heats the glass beneath it. A simple drop of water deposited upon the heated place will cause a clean breakage of the glass at that point. Contrary to what happens with the usual processes, the thicker the sides of the tube are, the better the experiment succeeds. It is unnecessary to say that this process is perfectly applicable likewise to laboratory bottles.

IMPROVED CAR COUPLING.

By means of the simple device shown in the accompanying engraving, cars may be coupled without the use of a coupling pin. In the upper surface of each drawbar, near its outer end, is formed a concave recess, inclining downward toward the extremity of the bar, and terminating in a cavity which is adapted to receive one of the balls of the coupling bar. In the recess and cavity the drawbar is slotted outwardly, and opposite the center of the cavity a flaring recess is formed in the end of the drawbar. In the bottom of the inner recess is a mortise extending downward through the drawbar. The coupling bar is a straight bar of iron, having its ends reduced in diameter, and having a ball upon each end. Coupling is effected by dropping the balls of the bar into the recesses of the drawbar, as shown in the two lower views, the lowest view being a plan. The coupling bar is held in position for coupling by standing it perpendicularly in the cavity, as indicated by the dotted lines, so that when the cars come together the jar will cause the bar to fall over and engage the empty drawbar. The drawbar may be formed with an eye at one end and ball at the other, when it is desired to use this improvement with the ordinary drawbar requiring a link and pin. The coupling bar shown in the top figure is designed to be attached to a locomotive, and is provided with a ball and eye, so that it may be used in connection with this or with the common drawbar. This device will couple on every ordinary curve and when one drawhead stands higher than the other, while the strain upon the bar is always a direct pull, no matter how sharp the curve may be, or how much difference there may be in the heights of the drawheads. In this coupling there is but one part to look after, instead of the link and two pins of the ordinary coupling.

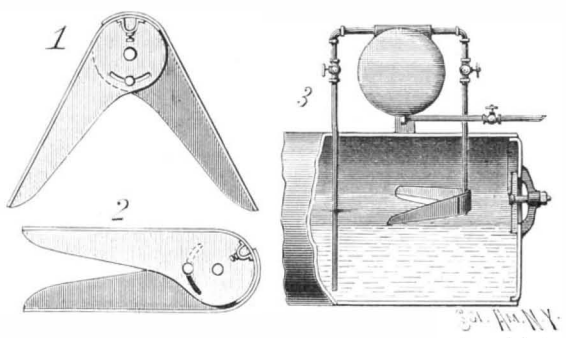
This invention has been patented by Mr. G. R. Mavis. Particulars can be had by addressing Messrs. Mavis & Burkhalter, of Wymore, Neb.



MAVIS' IMPROVED CAR COUPLING.

BOILER CLEANER.

The accompanying engraving represents an invention which has been patented by Mr. Albert De Camp, of Chattanooga, Tenn. The impurities in the water of the boiler are removed by a skimmer of novel form, thus preventing the formation of scale, etc. The skimmer con-

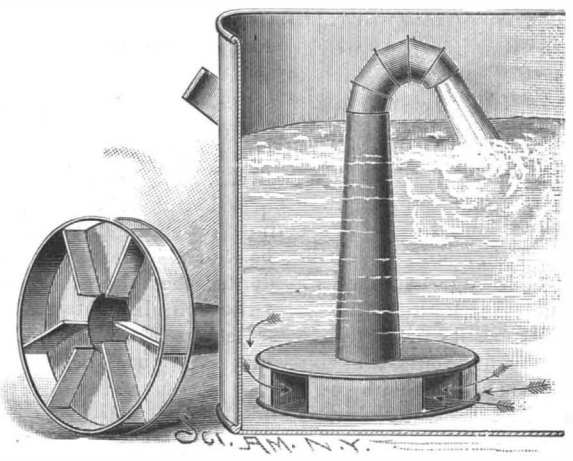


DE CAMP'S BOILER CLEANER.

sists essentially of two leaves, formed with rounded ends, and partially surrounded by upwardly extending flanges, which reach partly around the rounded ends. The sections are united by a rivet, and each is formed with a circular slot, through which a clamping bolt is passed, in order that the two leaves may be held together in any desired position. To the flange of the upper section is secured a strap having a set screw.

The skimmer is employed in connection with a blow-off attachment—illustrated in Fig. 3—in which the settling drum has a blow-off pipe provided with a valve. To the drum are secured two pipes, furnished with valves, and arranged as shown in the drawing. The skimmer is introduced through the manhole, and attached to the lower end of the shorter pipe by means of the strap and set screw.

After the skimmer has been secured, its two sections are spread apart until their ends strike the walls of the boiler, thus reaching across the water level at the rear of the boiler. As the circulation of the water is from the front to the rear end of the boiler, the impurities carried by it will be intercepted by the flanges and car-



DENNIS' WASH BOILER FOUNTAIN.

ried upward by a current passing through the short tube and into the drum, where they will settle. They may then be discharged through the blow-off pipe. The clear water at the top of the settlings passes back into the boiler through the other pipe. In Figs. 1 and 2 the leaves of the skimmer are shown extended as in use, and folded ready to be introduced through the manhole.

WASH BOILER FOUNTAIN.

The object of this invention, which has been patented by Mr. Charles W. Dennis, of 177 Jarvis Street, Toronto, Canada, is to provide a simple device to be applied to an ordinary wash boiler, for creating a circulation of the water through the clothes in the boiler. The hollow drum is provided with a series of internal radial partitions, which extend from the inner surface of the wall of the drum toward the central aperture. A hole is formed in the drum between each pair of partitions, and the chambers between the pairs of partitions communicate with the central aperture, around which, upon the upper surface of the drum, is a collar for receiving the discharge pipe. The drum is placed in the boiler with the open side down, and the discharge pipe curves over toward the center of the boiler.

The steam from the boiling water beneath the drum carries the water up through the pipe, while the cool water enters the drum through the holes in the wall, and is heated and carried upward in the pipe. In this manner a circulation is continuously maintained, the water entering below becoming heated and rising, and then, as it becomes cool, falling and passing on its way downward through the clothes contained in the boiler. The steam is generated principally in the chambers in the drum, in which the circulation is not strong, while the body of water employed in cleansing the clothes flows continuously through the rim openings and between the pairs of partitions, and is carried upward by the steam generated in the chambers.

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DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of New York.

SNYDER *et al. vs.* BUNNELL *et al.*

BURGLAR ALARM PATENT.

Coxe, J.

Where a person makes and puts on the market an article which of necessity, and to the knowledge of such person, is to be used for the purpose of infringing a patent, such person will be held liable under the doctrine of contributory infringement.

But the doctrine that a party may be held liable as an infringer solely because an article sold by him might be used by the purchaser as one element of a patented combination would be too dangerous to be upheld.

In order to hold a party liable under the doctrine of contributory infringement, there must be proof that what he did was for the purpose and with the intent of aiding infringement. (*Saxe vs. Hammond*, 1 Holmes, 456.)

Bill dismissed.

U. S. Circuit Court.—District of Massachusetts.

UNION PAPER BAG MACHINE COMPANY *et al. vs.* STANDARD PAPER BAG COMPANY *et al.*

PAPER BAG MACHINES.

Decided November 26, 1886.

Colt, J.

Claims 8, 10, and 13 of reissued letters patent No. 8,357, July 30, 1878, for improvements in paper bag machines, by opening the end of a tubular blank and forming the first or diamond fold thereof by means of the conjoint action of two adjacent moving surfaces, these surfaces consisting of two revolving rollers into which the blank is fed, the lower roller drawing the free or lipped end of the blank in one direction, while the other roller, moving in another direction, pulls the other side of the blank by the seam connecting it with the preceding blank, this operation extending the mouth of the bag into a diamond fold shape. *Held* not to be infringed by defendant's machine, which has only one roller and no second divergent moving roller, the fold not being formed by the conjoint action of two diverging moving surfaces.

U. S. Circuit Court.—District of Massachusetts.

BALTIMORE CAR WHEEL COMPANY *et al. vs.* BEMIS *et al.*

Carpenter, J.

This bill alleges that the complainants are the owners of and licensees under certain letters patent for cars and car axle boxes, and that the respondents have falsely and maliciously published statements and written letters to the effect that the complainants have failed in a suit for infringement of said letters patent brought against the respondents; that the axle boxes and gear manufactured by the complainants are infringements of certain other letters patent owned by the respondents, and that suits are about to be brought by the respondents on account of such infringement against the complainants and those who shall purchase and use their axle boxes and gears. The bill further alleges that by reason of the said false statements those who desire to purchase and use the apparatus made and sold by the complainants are deterred from so doing through fear of litigation, and the business of the complainants is thereby injured, and prays for an injunction. To this bill respondents demur.

We think the demurrer is well founded. There is no jurisdiction in a court of equity to enjoin libel on the rights or title of the complainant. We understand this to be the settled law both in England and in this country, in the absence of statutory provisions conferring such jurisdiction. The question is so fully and clearly discussed in the leading decisions that we do no more than cite them. (*Prudential Assur. Co. vs. Knott*, L. R., 10 Ch., 142; *Boston Diatite Co. vs. Florence Manufg. Co.*, 114 Mass., 69; *Kidd vs. Horry*, 28 Fed. Rep., 773.)

U. S. Circuit Court.—Southern District of New York.

OSBORN *vs.* JUDD *et al.*

DESIGN PATENT.

Shipman, J.

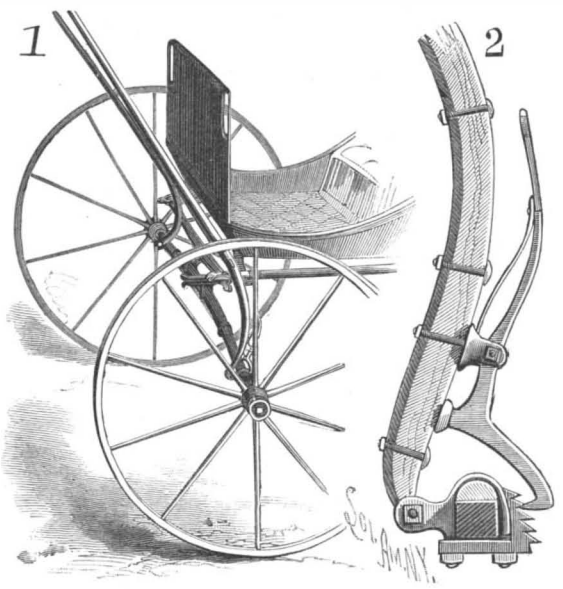
A preliminary injunction will not be granted to restrain the infringement of a "design for a banner rod, consisting of a conventional imitation of a straight twig with the bark and slantingly cut ends," the section which relates to design patents demanding, it may be supposed, the exercise of more genius than is exhibited by it.

Morbid Impulses.

What is the cause of a person having a feeling as though he had to jump or throw himself down, while standing near the edge of the wall of a high building, or place 40 or 50 feet above the ground? This question is asked of the editor of the *Herald of Health*, and his answer in the journal is as follows: "This feeling is due, we think, to a sudden confusion of mind produced by the new situation in which one finds himself when brought to survey the prospect from a lofty elevation. It is a change in relation to one's surroundings that seems at first to set experience at fault, and the faculties of perception, therefore, are at first disturbed and out of co-ordination. Size, weight, locality, etc., in many persons may require time to adjust themselves to the new conditions. Men who are accustomed to work at great elevations—roofers, painters, etc.—do not as a rule suffer from such morbid sensations, because their faculties have become educated to the relations of altitude."

IMPROVED SHAFT HOLDER.

Pivotally connected to the shafts, at the left hand side of the vehicle, is a bar shaped as clearly shown in the side elevation, Fig. 2. One end of this bar extends forward along the shaft, and is pressed upward



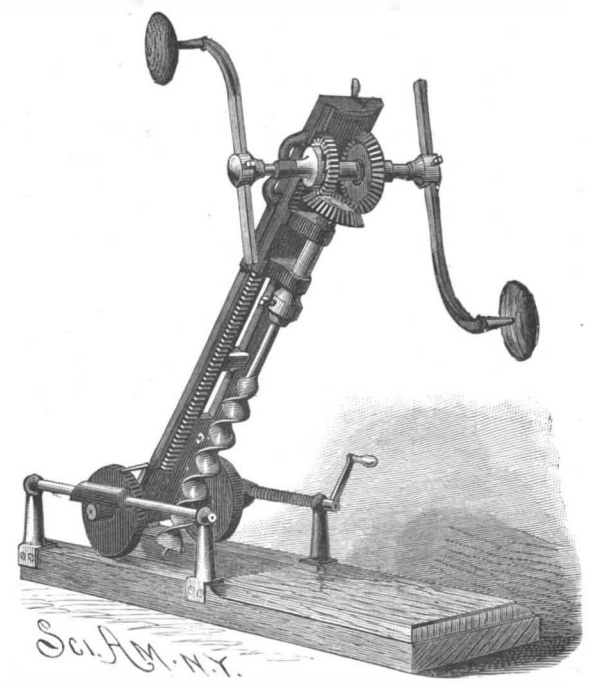
SPENNEBERG'S IMPROVED SHAFT HOLDER.

by a spring, while the other end is formed with a pawl, so that it may engage with a serrated plate secured to the rear side of the axle by the clip bolts. When the shafts are raised to the desired height, they will be caught and held in that position by the pawl engaging with one of the serrations of the plate. They will then be out of the way, and there will be no danger of their being broken. To lower the shafts into position for harnessing the horse, it is only necessary to press upon the outer end of the bar to detach the pawl, when they will come down gradually and without noise. This simple and efficient device will be appreciated by carriage owners, because of its many excellent features.

This invention has been patented by Mr. G. J. Spenneberg. Further particulars can be had from Mr. J. A. Donaldson, of Carrollton, Ky.

IMPROVED BORING MACHINE.

The boring machine illustrated in the accompanying engraving has many admirable features. When once placed in position, it will bore the whole mortise without being moved, thereby doing double the amount of work in the same length of time, and with greater ease to the operator, as the cranks are adjustable for large or small auger, soft or hard wood, and any speed may



DRYDEN'S IMPROVED BORING MACHINE.

be given to the auger. The machine is moved horizontally by means of the side screw, which is cut with two threads to the inch, and thereby forms a gauge. The machine may be adjusted to bore at any required angle. It will bore two or more holes to the same depth, as it has a stop provided for that purpose. The machine is compact, simple in construction, and efficient.

It is manufactured solely by Mr. George W. Dryden, of 23 Glen Street, Worcester, Mass., and may be seen at the Worcester (Mass.) Industrial Exhibition.

New Treatment for Phthisis.

A new method of treating phthisis has been proposed, but apparently as yet but slightly tried, by Professor Kremianski, who read a paper on the subject at the recent Moscow Medical Congress, which provoked a good deal of discussion. The idea is based, first, on the fatal effect of the most dilute solution of aniline on Koch's bacillus, and, secondly, on the fact that aniline seems to be but slightly, if at all, poisonous to the human body. Professor Kremianski proposes to introduce aniline into the lungs, and, indeed, the circulation generally, by inhalation, so that the phthisis bacilli would be bathed in a very dilute solution of aniline, wherever they may be. This, he thinks, would kill them, and render even pulmonary cavities free from bacilli, so bringing them into the condition of healthy granulating ulcers, which may be expected to cicatrize. A committee has been appointed, including Professors Subbotin and Ostroumoff, who expressed themselves at the meeting as strongly opposed to the plan, for the purpose of observing Professor Kremianski's proposed experiments in one of the Moscow hospitals.

Two cases in which the aniline treatment had been successfully tried were detailed. A lad of eighteen, who had undoubted phthisis, was ordered a four drop dose of aniline (but took by mistake three times the proper quantity) combined with nux vomica, mint water, and antifebrin, his diet being good, including dried meat, kvas, and oranges. He was also given inhalations of atomized aniline. A remarkable change took place almost immediately, all the rales disappearing; his temperature, respiration, and pulse becoming normal. His skin, however, assumed a slightly blue tinge; but whether this was as permanent as the cure is represented to have been is not stated.

The second case was a complicated one, there being tubercular peritonitis and meningitis, together with typhoid fever, present at the same time as pulmonary phthisis. Aniline inhalations, washing out the pulmonary cavities with corrosive sublimate and antifebrin, were employed, together with a special acid diet, as in the other case. Here, too, the results are said to have been remarkably good, the bacilli disappearing from the sputum, and the patient regaining his health entirely. No mention is made in the abstract published by the *Vrach* of any change of color in this patient's skin.

Among the various replies that were made to Professor Kremianski, Dr. Zakrzhevski, of Helsingfors, remarked that, admitting the facts as stated, still there was nothing to show that the aniline had been the cause of the cures. He himself had had surprisingly good results in phthisical cases, the disease becoming completely arrested by simply giving increased nourishment and prescribing antipyrin.—*Lancet.*

Manufacture of Carbon.

The following item, says a correspondent in the *Electrical World*, I have picked up, and it ought to be of interest:

"The manufacture of carbons for electric lights has become an important business. At a trial in Cleveland for alleged infringement of patent, a witness testified that of 150,000 carbons burned daily in the United States, 100,000 are manufactured in Cleveland, where there are 20 furnaces. The carbons are made chiefly of the residuum of oil after it has been refined, but the deposit about natural gas wells is also coming into use. The material is ground to a powder, a little pitch is added, and the substance is then placed in moulds. These are packed in boxes and the latter placed in a furnace, where they are subjected to the most intense heat. The capacity of an ordinary furnace is 45,000 carbons. Through the use of a movable furnace roof, the patent on which forms the subject of contention, two furnaces are constructed side by side, and while the carbons in one are being burned the other is loaded with boxes of moulds. Under this system two men load a furnace in one day, the carbons are thoroughly burned in five days, and the cooling process continues only 24 hours."

A Remarkable Dog Story.

John Templeton is a blacksmith who owns a fine specimen of the English mastiff. Recently Mr. Templeton was working at his forge, putting a new steel in a pick. The new steel was slightly burned in the heating, and, instead of welding, flew in half a dozen pieces. One piece struck the blacksmith just above the right eye with such force as to fasten itself in firmly. The blacksmith staggered and fell backward. How long he was unconscious he does not know, but when he revived the dog lay almost in the middle of the shop crying almost like a human being, and rubbing his jaws in the dust of the floor. The piece of steel that had struck Mr. Templeton lay a short distance from the dog. The faithful brute had seized the hot steel with his teeth and drawn it from the frontal bone of Mr. Templeton's head. The dog's mouth was found to be badly burned.—*Albany Journal.*

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YACHT RACE ACROSS THE ATLANTIC.

On March 12, the transatlantic yacht race from Owl's Head, New York harbor, to Roche's Point, Queenstown harbor, was started. Up to the present writing (March 26), the relative position of the two competing yachts is unknown, as the reports brought in by the steamers are vague and conflicting. It therefore seems probable that the first authentic information will be sent out when the winner crosses the finish. Quick time is not looked for, owing to heavy seas and adverse winds.

The race is the result of a challenge issued by the owner of the Coronet, and is "for the purpose of testing and comparing the sea-going and sailing qualities of keel-schooner yachts built and now owned in this country." The race was open to all yachts of this description of American build, without any allowance whatever. This challenge was accepted by the owner of the Dauntless, and each yacht put up $10,000, so that the winner will receive double this amount, less incidental expenses.

The principal dimensions of the two yachts are given below:

	Coronet.		*Dauntless.*	
	Ft.	In.	Ft.	In.
Length over all	133	0	124	0
Length on load water line	123	0	117	7
Extreme beam	27	0	26	7
Extreme draught of water	13	6	12	3
Least freeboard	3	6	3	7
Length of mainmast	91	0	85	6
Length of main boom	68	0	68	0
Length of topmast	86	0	46	0
Perpendicular of sail triangle, as per New York Yacht Club rule	106	0	107	0
Base of sale triangle, as per New York Yacht Club rule	134	9	133	6
Sail tons, as per New York Yacht Club rule for racing measurement	114		111·2	
Area of lower sails in square feet	7,185		6,941	
Area of top sails in square feet	1,120		1,093	
Area of square sails in square feet	3,135		2,865	
Load displacement in tons	277		215	
Ballast in tons	126		80	
Tonnage, old measurement	380		267·7	

The Coronet is considered to have two distinct advantages over her rival—she is larger and newer. She was built by the Poillon Brothers, at South Brooklyn, in 1885, while the Dauntless was constructed twenty-one years ago, at Mystic Bridge, Conn., by Forsyth & Morgan.

The Coronet crossed the finish line first, at 12:41 P. M., Queenstown time, on March 27th. Her time is next to the best ever made by a yacht from New York to Queenstown, and is especially remarkable as the weather, during the entire voyage, was uncommonly tempestuous, even for this season of the year. The actual time from the start was 14 days 19 hours 3 minutes and 14 seconds. The whole number of nautical miles sailed was 2,934. The longest day's run, 291·5 miles, was made on the 26th, and the two shortest, 39 and 51 miles, on the 22d and 23d respectively.

The Dauntless was sighted at 11 A. M. on the 28th.

How to Electroplate Flowers, Insects, Etc.

Among the most recent efforts in this direction may be mentioned the improvements in the preparation of organic matter for metallization by galvanic deposit recently introduced by La Societe anonyme de Metallisation artistique des Animaux, Vegetaux, ou auter corps, of Paris, whose process consists in the employment of an albuminous liquid, with which the different substances in question are treated to prepare them for metallization. This liquid may be thus obtained: A quantity of snails or slugs are first washed in ordinary water, to free them from all earthy or calcareous matter; they are then placed in a vessel containing distilled water, and are left here sufficient time to give off slowly their albuminous matter.

The albumen thus obtained is now filtered and boiled for about an hour. After the boiling is added a quantity of distilled water sufficient to replace that lost by the boiling, and about 3 per cent of nitrate of silver. This liquid is then placed in bottles, hermetically closed, and kept in the dark; it will thus keep without any alteration. To use this liquid for the preparation of the objects, about 30 grammes of it is dissolved in about 100 grammes of distilled water. In this solution the objects are submerged for a few moments; they are then placed in a bath consisting of distilled water with about 20 per cent of nitrate of silver in solution, and afterward submitted to the action of hydrosulphuric gas, to reduce the nitrate of silver adhering to the albumen-covered surface of the object.

Thus treated, all organic matter is rendered fit to receive a galvanic deposit; and the galvanic products obtained by this process are far superior in fineness and neatness to those obtained by any other known process. Even the finest and most minute fibers and veins, the smallest unevenness of surfaces, and hairs scarcely visible to the naked eye are clearly discernible, and come out with striking neatness, the metallic deposit being of perfectly uniform thickness and adherence.

Steamship Economy.

At a recent meeting of the Engineering Section of the Bristol Naturalists' Society, a paper on "Compounding Oscillating Marine Engines," of which the following is a summary, was read by Mr. J. W. J. Harvey:

In describing the method adopted, attention was called to the fact that in the search after economy the history of these engines is somewhat unique, if not altogether exceptional, from the circumstance that no less than three separate classes of engines had been at work in the same vessel—the Juno—viz., "jet condensing," "surface condensing," and "compound," under almost identical conditions of "draught of water," "displacements," "midship area," "propeller," etc., from which probably may be drawn some useful conclusions as to the cost of motive power in steam vessels, having regard to the description of machinery employed. With the "jet condensing" engines, working with a boiler pressure of 30 lb. per square inch, an indicated horse power of 1,605 was developed on a consumption of 92 tons of coal per voyage, giving the vessel a speed of 14 1-10 knots per hour. Subsequently the engines were fitted with a surface condenser and new boilers working at the original pressure of 30 lb. per square inch, when the same indicated horse power and speed were maintained on a reduced consumption of 84½ tons of coal per voyage.

At the time the above alterations were made—although it was seriously under consideration to fit the vessel with compound engines—the competition was not so keen as to warrant the heavy outlay such a change would have involved, and recourse was therefore had to the surface condensing arrangement. In process of time it is scarcely necessary to be reminded that competition in the shipping trade had become much more severe, so that the vessel had to compete with others in the same trade more recently built and fitted with compound machinery, and it is evident that she would be out of the race unless a considerable reduction could be made in the coal bill. The vessel was too good and too great a favorite to be cast aside as obsolete; and as the outlay for entirely new compound machinery would not have been justifiable, it was determined to compound the existing engines at as moderate a cost as possible, at the same time maintaining such a rate of speed as would enable her to hold her own with her more modern rivals. In carrying out this idea it was necessary to retain as much of the existing machinery as possible, and to do this it was determined to keep one of the existing cylinders as the low pressure cylinder of the compound arrangement, and to so proportion the new high pressure cylinder as to obtain the maximum power possible, and by this means the greater part of the existing machinery was preserved, one cylinder, the entablatures, shafts, paddle wheels, condenser, side frames, air, circulating, and bilge pumps being retained, and the new parts required consisted only of one cylinder, two sets of link motion, two feed pumps, a steam starting engine, and, of course, a pair of cylindrical boilers working at 80 lb. pressure. The result was a compound engine having cylinders 40 in. and 66 in. diameter by 72 in. stroke, giving 1,270 indicated horse power, and a speed of 13 4-10 knots per hour, on a consumption of 49 tons of coal per voyage, the conditions as to draught of water, etc., remaining the same as before. The conclusions to be drawn are, therefore, that with 335 less indicated horse power, we have the loss of three-quarters of a knot in speed, or, in other words, it takes 335 indicated horse power to get the last three-quarters of a knot, or about one-fifth of the whole power; that, when working with the jet condenser, the coal consumption was 92 tons per voyage. When working with the surface condenser, the consumption was 84½ tons per voyage, or a saving of 8¼ per cent; and when compounded, the consumption was 49 tons per voyage, giving a saving of 46¼ per cent over the jet condenser, and 42 per cent over the surface condenser. This result was deemed highly satisfactory, and has enabled the vessel to compete successfully with those of a more modern type, and to retain her place on the line in which, through all weathers and seasons, she has established for herself a favorable and widespread reputation.

Peach Kernel Oil.

M. P. Guyot (*Rep. de Pharm.*) gives the following tests for oil of peach kernels:

With caustic alkalies it gives a dark yellowish-brown soap, easily soluble in distilled water. With phosphoric acid, at first a yellowish-brown emulsion, which becomes gray and then loses its color. Chloride of zinc forms dirty gray flocks in the liquid; and sulphuric acid, an orange-yellow coloration, passing through various shades of brown and red to a dark brown, the oil giving off a distinct odor of oil of bitter almonds as soon as it becomes warm. Sulphocarbonate of sodium affords an orange-yellow coloration, and acid nitrate of mercury produces no effect except when sulphuric acid is added, when the oil becomes of a clear citron-yellow. Bisulphide of calcium forms, with the oil, a granular canary-yellow soap, which subsequently loses its color.

Correspondence.

Centennial of the United States Patent Laws.

To the Editor of the Scientific American:

Noticing in your paper on the 12th ult. Mr. E. M. Shields' suggestion of celebrating in 1890 the centennial of the adoption and foundation of the United States patent office laws, I am pleased to see this important matter taken hold of by the SCIENTIFIC AMERICAN.

There is no doubt if all the inventors and men who have become rich through inventions would take an active interest in the matter in time. Why should we not have a celebration which would do credit to our country, and possibly be able to show the world that our country is the mother of invention?

DAVID G. WEEMS.

Baltimore, Md., March 16, 1887.

Absorption through the Skin.

Ritter and Pfeiffer.—The method followed in their experiments was to rub well into the extensor surface of a healthy limb half an ounce of an ointment containing the substance under investigation, then to cover the spot with a protective bandage to prevent any possible absorption by the lungs, and after twenty-four hours to collect some urine and examine it for the presence of the drug. It was found that potassium iodide from a 10 per cent ointment passed into the urine in only one out of five cases, and this was after the ointment had been used for four days, when the skin had become irritated and its continuity practically destroyed by the prolonged action of the fatty acids derived from the decomposition of the lard. Sodium salicylate applied in the same way was never found, even in traces, in the urine; but salicylic acid invariably gave its characteristic color test with ferric chloride within a few hours after its application.

This behavior of salicylic acid is attributed to the property possessed by it of softening the epidermis and rendering it permeable, and the extent to which this takes place is shown by the fact that if the application of salicylic acid ointment be followed by one of potassium iodide ointment, the potassium iodide quickly passes into the org nism and becomes detectable in the urine. When lard was replaced by lanolin, it was not found that the ointment manifested any superior penetrative power. Some other experiments made to test the capability of the skin to absorb substances sprayed on to it in watery solution gave, when precautions were taken to exclude the spray from the respiratory passages, only negative results.

The Bids for Steel Armor Plates and Gun Forgings.

On March 22, four bids were opened by Secretary Whitney. These tenders referred to the supplying of "about 1,310 tons of steel gun forgings" and "about 4,500 tons of steel armor plates and appurtenances." The following is the abstract of the companies competing and of the terms agreed to:

Name of Company.	Armor plate.	Gun steel.
Cambria Iron Company	.....	$851,513.90
Midvale Steel Company	.....	1,397,240.00
Bethlehem Iron Company	$3,610,707.50	902,280.79
Cleveland Rolling Mill Co.	4,021,560.00	.....

The Bethlehem Iron Co. agrees to provide the necessary plant to begin the delivery of the gun forgings within fifteen months, five months in advance of the requirements. It asks for the preference agreed to be given to the bidder who furnishes both classes of forgings, according to the naval department circular of August 21, 1886. The company, to prove its ability to carry out the contract, a condition exacted by the government, states that it has expended between $300,000 and $400,000 on its forging plant, and has on hand contracts amounting to $500,000. It states that financial arrangements have been made for $1,500,000 additional capital, and special engagements for the use of patents and for superintendence have been provided for with the largest European firms. The latter clause is said to refer to the great French works at Le Creusot. It is a source of the greatest gratification to find our American firms ready to undertake this work. It gives an additional proof of what always has been very patent, that the inventive and engineering genius of the country are able to cope with all of its needs and emergencies.

A Paradise for Messenger Boys.

Intense excitement has been caused among the messenger boys employed by the Baltimore and Ohio Telegraph Company in Washington, D. C. A dozen Australian ponies for the use of the messenger boys recently arrived, and since then the boys of the city have gone wild over them. The ponies are small and very handsome, and as they stand saddled and bridled, with a rubber covering strapped on behind the saddle, they present a very neat and trim appearance, and, like the boys, they seem proud of their position. Since their arrival the B. & O. has been overrun with boys who want to be messengers, and are willing to work for nothing just to be able to ride one of the ponies.

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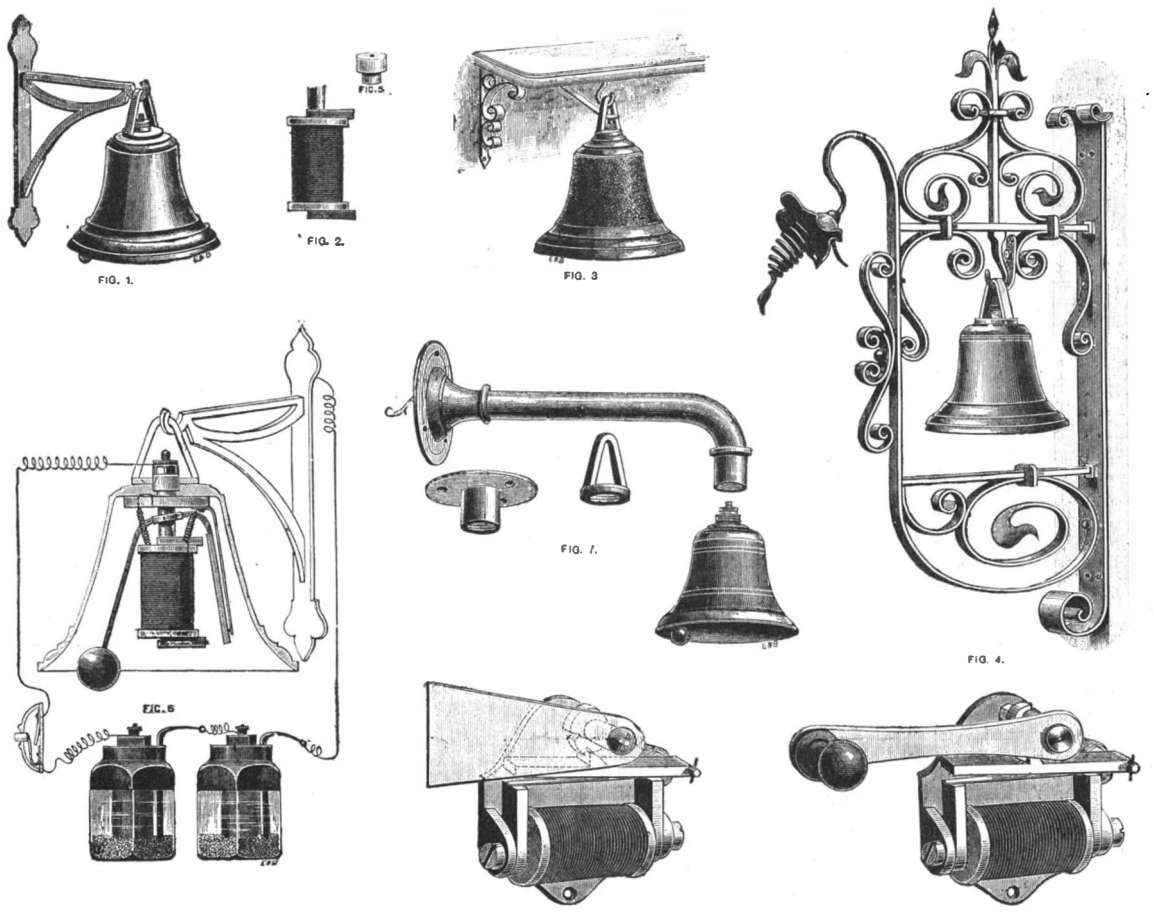
THE JENSEN ELECTRIC BELLS.

The special object of our visit to the show rooms of the Jensen Electric Bell and Signal Company, at No. 2 Gray's Inn Road, London, was to inspect a large consignment of bells on the Jensen system, for America, and which are designed for railway, telegraph, hotel, and private use. This system we now illustrate, and from our engravings it will be seen that the unsightly magnet box is dispensed with, and the hemispherical bell replaced by a bell of the church type, as at Fig. 1, inside of which is the electro magnet. This is a single solenoidal magnet of special construction, as seen at Fig. 2, and by it the armature is attracted by both poles simultaneously. By this means less than half the usual quantity of wire is required, thus reducing the external resistance of the circuit one half. Moreover, the armature, besides being magnetized by induction, as acted on in the ordinary method of making electric bells, is directly polarized by being in actual magnetic contact by the connection of the gimbal (which is in one piece with the armature) with the core iron of the magnet. It is thus induced to perform the largest amount of work with the smallest electromotive force. Instead of the armature and clapper being in a straight line attached to a rigid spring, which necessitates a considerable attractive power to primarily give it momentum, in the Jensen bell the armature and hammer are in the form of an inverted U, and, being perfectly balanced from the point of suspension, the lines of force from a comparatively small magnetic field suffice to set this improved form of armature into instant regular vibration.

By using a flexible break and make arrangement instead of the usual armature spring and set screw, a better result is attained, and the armature can be set nearer the poles of the magnet with sufficient traverse of the hammer. The reason why these bells require so little battery power to ring them is, first, because the armature and hammer are so perfectly balanced as to offer but little resistance; secondly, because the external resistance to the current is reduced; and, thirdly, because the best possible use is made of the electro-magnetic force at disposal. The bells are of elegant appearance, very sonorous, and can be fixed in any position, as exemplified by Figs. 3 and 4, the artistic mountings serving to show their symmetrical forms to advantage. Fig. 6 of our engravings is a sectional view of the bell and movement, showing the whole arrangement as already described.

Fig. 5 illustrates more clearly the insulator which acts as a collet for holding the movement securely in the bell, and at the same time effectually insulates it, so that by taking one end of the coil wire to the bell, as shown in our engravings, the bell, and consequently the bracket or hook it hangs on, forms one contact, and the terminal of the movement, as seen projecting through the top of bell, the other. For trembling bells, the other end of coil wire is fastened to the contact spring, for single strokes to the movement itself. An important feature is that by a simple arrangement the hours can be simultaneously struck on a number of bells, so that, if desired in a public building, large factory, an office, or for domestic use, the exact time can be synchronously rung out on as many bells as may be mounted in various places. Fig. 7 shows an arrangement for fixing the bell rigidly on board ship, or in any other circumstances where it is subject to oscillation.

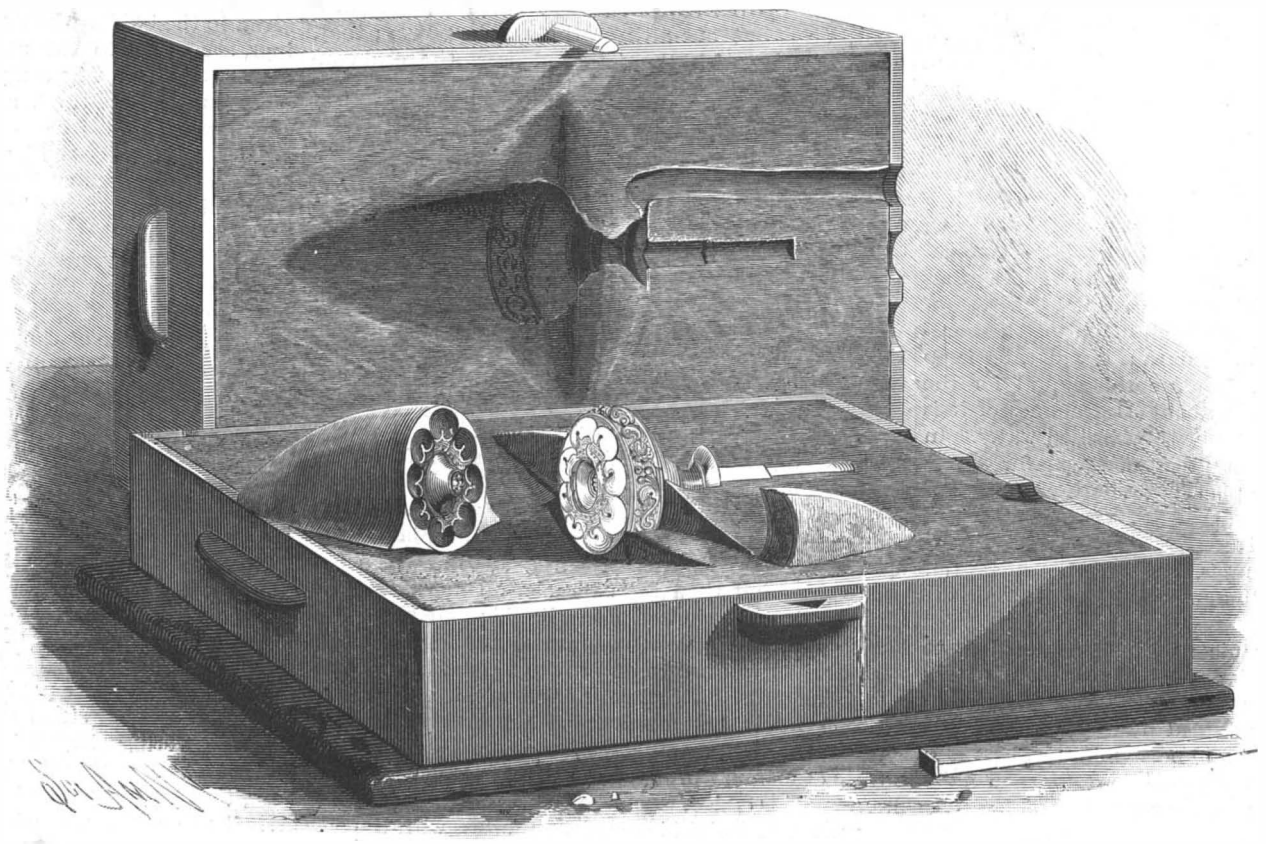
The eye for suspending the bell on a hook will be seen to have been unscrewed and the bell placed in position for screwing on to the horizontal arm, or it can be screwed up to the vertical holder, seen to the left. Figs. 8 and 9 represent the Jensen indicators, which are exceedingly simple, there being no permanent magnet or other arrangement likely to get out of order. By a simple and inexpensive arrangement the bell can be fitted with a responding attachment, so that a person ringing to a servant can receive, by the servant pressing the button on his or her bell, an intimation that the summons has been heard and will be attended to. —*Iron.*



IMPROVED ELECTRIC BELLS.

MOULDING AN OLD FASHIONED KNOB.

A short time since, it became necessary to reproduce an old fashioned brass knob, which was so ornamented with raised figures as to prevent its being moulded in the ordinary way. The knob was made of hammered sheet metal, the top rim and back being in separate pieces, united by burnishing, and the shell thus formed being filled with plaster. The accompanying engraving shows clearly how the knob was moulded, the method pursued being similar to that used in moulding intricate figures for casting in bronze. The sand was packed closely around one-half of the knob and its shank, and was then scraped entirely away from the top, while the rim was left covered for about one-third of its circumference and the shank for about one-half. The sand was then dusted, to prevent the next addition from adhering. Sand was then packed against about one-sixth of the rim at each side, so that up to this point two-thirds of the rim had been covered. These two pieces were then dusted, when the entire top was moulded in one piece, as shown. The final operation was forming the cope or uppermost piece, which received the impress of the upper third of the rim and upper half of the shank. The five pieces comprising the mould were then separated, the knob removed, when the parts were reassembled, baked, and the metal poured in through suitable gates in the usual way. The casting was sharp, clear, and a perfect copy of the original, to which it was decidedly superior, as it was made of one solid piece of metal. This specimen of moulding was done by Mr. James Kane at the brass foundry of Mr. James Reynolds, New Haven.



MOULDING AN OLD FASHIONED KNOB.

On Sugar in the Blood.

A series of scientific and profound researches has been completed by Prof. Seegen, of Vienna, which has as its result the establishment of the fact that the sugar formed by the liver is derived from albumen and fat.

A portion of the results obtained were published some time ago, and the general conclusions of the whole work are as follows:

1. That the blood passing from the liver contains an infinitely greater quantity of sugar than that entering the organ.

2. The newly formed sugar in the liver is wholly independent of saccharine food, as well as of the carbohydrates introduced with the food.

3. Even the liver glycogen is unconcerned in the production of sugar in the liver.

4. Albumen and fat are the materials out of which the liver forms sugar.

The fact that sugar is formed from fat is a new one, and is not in accord with the previously entertained chemical and physiological ideas. It appeared to the author, therefore, of much interest to experimentally demonstrate the conversion of fat into sugar. This was accomplished by bringing together fatty bodies and blood with finely divided liver substance. The settlement of this question, that sugar is formed from fat by the liver, seems to point to that organ as the great laboratory in which the food is changed for the purposes of life, for the performance of work and the production of heat. It has a great practical significance, inasmuch as it teaches us the full worth of fat as material for food.—*Med. Review.*

THE shafts for the three U. S. Government vessels to be built by Messrs. Cramp in America are contracted for by the English steel makers, Messrs. Whitworth & Co.

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PLAGUE OF LOCUSTS IN AUSTRALIA.

In the beginning of December last the Wallaloo and other districts of Victoria were visited by a plague of locusts, or rather grasshoppers. The amount of damage done was enormous; the farmers being driven to their wits' end as to what they should do with their stock until the summer is past, as grass as well as corn crops have disappeared before the advance of the clouds of insects. Hundreds of acres of crops have been eaten down to the ground, and hundreds of other acres partly destroyed. Reading & Sons in one day had 50 acres of crop, expected to yield 20 bushels to the acre, half destroyed, and 100 acres greatly damaged. In less than one week they had three selections of good grass leveled to the ground. S. Andrew had about 70 acres of wheat crop greatly damaged. During the time the reaper was cutting his oat crop the locusts ate more than half of it, and in a few days cleared his two selections of all grass. George Maunder had sixty acres of wheat badly injured, and his oat crop nearly eaten up. Two reapers could not cut down the crop fast enough to keep pace with the destruction of the pest. John Maunder had thirty acres of oats eaten up stalk and stump and his wheat crop was greatly injured. A. Main, T. Aldred, and several others have been great sufferers. The district looks like a barren waste. On the Wallaloo Station there is not sufficient grass to feed the sheep. Fortunately, in some instances, the wheat crops are so far advanced that both stalk and grain were too hard for the pest to do much damage, any farther than eat off the low heads. Consequently, a few good crops are left standing, but these are few and far apart. Marnoo, Banyena, Cope Cope, Swanwater, Darkbonee, and other localities have suffered greatly. The locusts travel in companies about two miles wide, from two to three miles in length, and are from one to two inches thick upon the ground. They are clearing everything before them at the rate of about three-quarters of a mile each day. Myriads of the insects have also visited the Great Western, where a number of young vines were destroyed. The old ones were not touched.—*Town and Country Journal.*

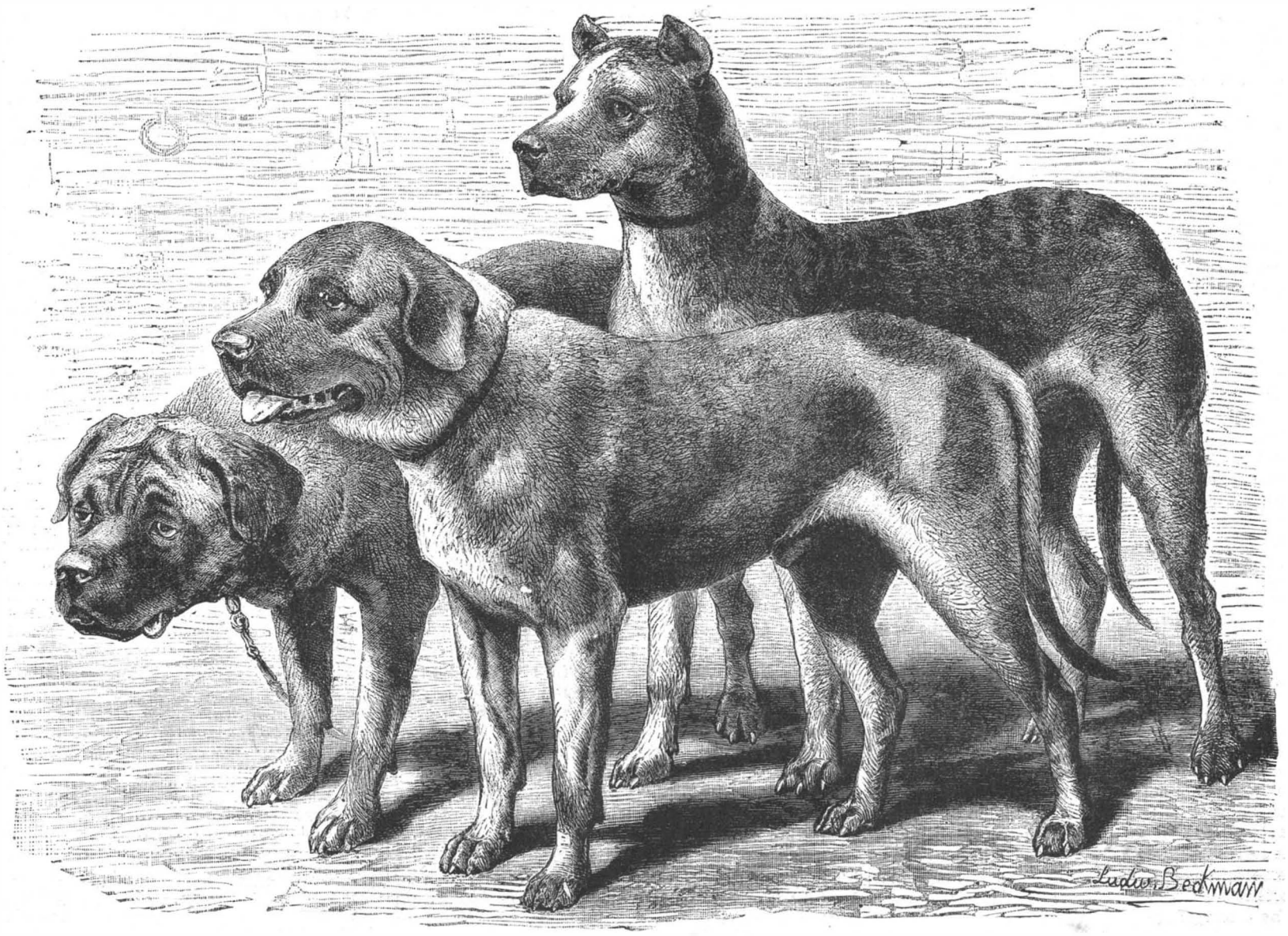
THE PLAGUE OF LOCUSTS IN AUSTRALIA.

THREE RELATED BREEDS OF DOGS.

Formerly, hunting exhibitions were held in the park of the Rosenborg Castle at Copenhagen, and in connection with the first of these there was a show of dogs from all countries, which offered much that was new and interesting to lovers of these animals. In this way attention was called to the Danish dog, which does not resemble the German bulldog, but is undoubtedly a near relative of the English mastiff. It is difficult to decide whether there has been a cross here with the mastiff, or whether the Danish dog is simply a type of the heavy stag hound (*C. molossus*), from which, in the course of time, have come the English mastiff, the German bulldog, and, perhaps, also the progenitors of the present short haired St. Bernard. The finest of this class have been bred for the last thirty or forty years on the Broholm estate, from which they are called Broholm dogs. In the neighborhood of Copenhagen these dogs are seen everywhere. It is, in fact, a national breed, and although all specimens are not of equal value or size or of the same color, still there is a certain common type which is unmistakable. As the Kennel Club of Copenhagen has made a point of preserving and improving the breed, and has officially established the race marks, a greater uniformity will probably be reached. It is to be hoped that the past of the race and its relationship to the mastiff will be made subjects of investigation, as opinions on these points have heretofore been very divergent.

A repetition of the official enumeration of the marks of the breed would fill too much space, and therefore we will limit ourselves to mentioning a few of their characteristics. The Danish dog is of the same height and strength and, ordinarily, also of the same shape as the mastiff, but he is not so heavily built, and reminds one more of a powerful hunting dog. His head is not so broad, his ears are comparatively small, set high and lie smooth, his forehead is smooth (not wrinkled like that of the mastiff), the bridge of the nose is slightly arched, and the lips do not hang so low; his eye has a good natured and intelligent expression, and shows no red at the corner. The color of the short, fine hair is reddish yellow (not ashy gray or dark brown, as is the mastiff's), and the muzzle and eyebrows are darker. Ordinarily, the Danish dog can run better than the pure mastiff, is not so heavy, is quicker and more active, and is highly commended as a companion and watchdog.

As is shown by the accompanying cut, the Danish or Broholm dog bears no resemblance to the German bulldog. The progenitors of the latter were carried from England and Ireland in great numbers in the



THREE RELATED BREEDS OF DOGS.

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sixteenth century, and seventeenth century writers tell us that the race had increased to such an extent and the breed was kept so good that all importation of the dogs into Germany had ceased.

In the year 1876 there was a great international dog show at Hamburg, and on this occasion the breeders and connoisseurs present failed to establish a difference between the dogs to which the terms "Ulmer" and "Danish" had been applied in Germany; and at the shows held later in Berlin and Hanover, it was decided that there was no such difference, and that the animals to which these names had been given were really the German bulldog of three centuries back.

A fourth breed of dogs, the small but strongly built and plucky bulldog, is too well known to need any further description.—*Illustrirte Zeitung.*

Increasing Moisture in Rooms.

In a communication to the *Sanitary Engineer*, Mr. Henry R. Towne, president of the Yale Lock Manufacturing Company, at Stamford, Conn., says:

"As to my method of using steam for increasing the moisture in rooms, I will explain as follows:

"My house is heated by an indirect steam apparatus. Soon after building it I ascertained, by using a Mason's hygrometer, that in winter the air in the house was very dry, the humidity ranging as low as between 30 and 40 per cent of the dew point. Many sanitary authorities agree that 60 per cent humidity is desirable for health, and my personal experience seems to confirm this view. I thereupon endeavored, in various ways, to raise the percentage of humidity. I used evaporating pans and porous cups in front of the registers. Experimentally I tried wet cloths hanging from pans of water, which, by capillary action, gave considerable evaporation. All of these devices combined, however, failed to increase the moisture more than from 5 to 10 per cent.

"Finally, I made a small connection in one of the indirect steam coils, whereby I could admit a small jet of steam into the air box just under the coil. I at once found that this enabled me to raise the humidity to any desired point, the limit practically being that at which condensation on windows occurs. Since then I have had this arrangement applied to two of the coils on the main floor of my house, with the stems of the steam valves of the arrangement carried up from below, so the valves can be conveniently regulated from the room in which the moistened air is received. These valves are so adjusted as to allow a constant, but small, flow of steam into their respective air boxes. This is mingled with the inflowing air as it enters the heating coil, and is carried with it to the rooms above. The steam is delivered in each box through two one-fourth inch pipes, three inches apart. Under these hangs a small pan which catches the water of condensation as it drips from the ends of the steam pipes. A small overflow pipe carries off the water from these drip pans.

"With this arrangement I easily keep the moisture of my house at 50 to 60 per cent of saturation during winter. It is easy at any time to increase this percentage, but the result in cold weather is to cause rapid condensation on the windows, which is not desirable. A room heated to 70°, with the humidity at 60 per cent, is far more comfortable than one heated to 80°, with the humidity at 40 per cent, in my experience, as the former conditions are far more healthful. I am sure that the general adoption of my method of moistening the air in steam heated houses would be conducive to both health and comfort to all who live in them."

Asbestos Paper.

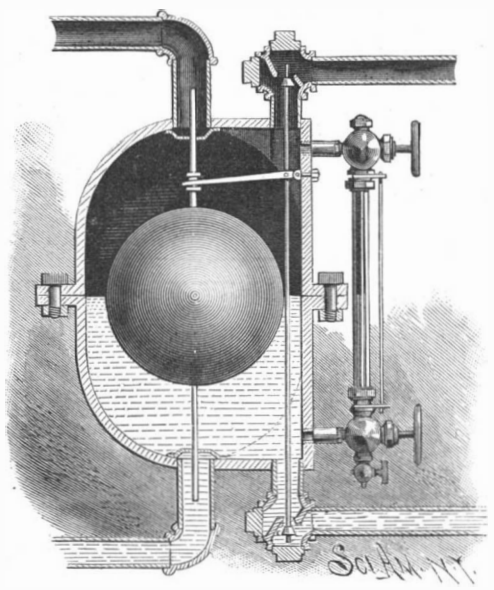
Mr. Ladewig has devised a process of manufacturing from asbestos fiber a pulp and a paper that resist the action of fire and water, that absorb no moisture, and the former of which (the pulp) may be used as a stuffing and for the joints of engines.

The process of manufacture consists in mixing about 25 per cent of asbestos fiber with about from 25 to 35 per cent of powdered sulphate of alumina. This mixture is moistened with an aqueous solution of chloride of zinc. The mixture is washed with water, and then treated with an aqueous solution of ammoniacal gas. The mixture is again washed, and then treated with a solution composed of 1 part of resin soap and 8 or 10 parts of water mixed with an equal bulk of sulphate of alumina, which should be as pure as possible. The mixture thus obtained should have a slightly pulpy consistency. Finally, there is added to it 35 per cent of powdered asbestos and 5 to 8 per cent of white barytes. This pulp is treated with water in an ordinary paper machine and worked just like paper pulp.

In order to manufacture from it a solid cardboard, proof against fire and water, and capable of serving as a roofing material for light structures, sheets of common cardboard, tarred or otherwise prepared, are covered with the pulp. The application is made in a paper machine, the pulp being allowed to flow over the cardboard. Among other uses, the asbestos paper has been recommended for the manufacture of cigarettes.—*L'Industrie Moderne.*

BOILER FEED REGULATOR.

Extended practical use has demonstrated that the machine herewith illustrated secures a uniform flow of water to the boiler, and holds the water in the boiler at whatever water line may be adopted. The tank in which the float rests is connected at the top with the steam space of the boiler, and at the bottom with the water space. Through the float is inserted a rod passing through holes in guides at the top and bottom of the tank. Actuated by this rod is a lever that operates a rod having a valve at both its upper and lower ends—the upper valve being in a pipe that conducts steam from the tank to the pump, while the lower valve is in the pipe conducting water from the pump to the tank. As the water lowers in boiler and tank, the float descends and operates the lever to open the valves. Steam is thus admitted to the pump, which forces water into the tank. As the water rises, the float ascends, and the valves are closed. Thus the pump is kept in motion sufficiently to supply the boiler, in which the water never rises too high or falls too low. The machine is absolutely free from packing, and has no bearing exceeding an eighth of an inch in length, so that friction is reduced to a minimum. The same and a uniform water line can be maintained in a battery of boilers, even if not provided with a mud drum and steam dome, but in such a case it would be necessary to provide each boiler with a machine. The regulator is so attached that it will not interfere with the pump connections in use, and, as shown in the engraving, is furnished with a water glass. A steam



WYMAN'S BOILER FEED REGULATOR.

gauge may also be attached. The simplicity of the device is evident, and its superiority is shown by the fact that its use has produced a saving in fuel, has enabled the engines to do more and better work, has prevented the burning of boilers, and has done away with leaking of the boilers.

This invention has been patented by Mr. Charles O. Wyman, Anoka, Minnesota.

Armor Plates.

In our consideration of the relative qualities of steel faced, or compound, and solid steel plates for the protection of belted, turreted, or barbette war ships, it is obvious, if we are to draw a conclusion from the consensus of nations and the awards of contracts by war offices, that the compound type possesses superior merits to the solid steel. Practically, the fact that over 70,000 tons of the former have been purchased and less than 20,000 tons of the latter, and that France has preferred the production of English metallurgists to that of Baron Schneider by a ratio, from 1880 to 1886 inclusive, of 14,957 tons in favor of the Sheffield armor as against 7,860 tons of the Creusot, would seem to be a conclusive argument for the compound type. We do not propose, however, to be actuated by simply commercial facts in our estimate of the qualities of the competitive systems. To adopt the precedents set by European nations in the character of war material, out of hand, would be not only inconsistent with American tradition, but antagonistic to the interests of domestic enterprise and production. The essays of England, France, and Germany in the direction of both guns and armor, it must be remembered, are yet but tentative.

The question of protection for our war ships is essentially one which we can decide for ourselves, and, when the type to be used shall be determined, can answer for ourselves. Though European contractors first put in actual shape the idea of an ironclad, the inspiration was our own, and the first trial of armor in warfare was in American waters.

The original armor for protected vessels was of wrought iron. At present the two types are of solid or homogeneous steel or of a steel face backed by wrought iron, the latter being known as compound. So far as we know, expert manufacturers in the United States would recommend the latter type, and we refer to such producers of plate as Moorhead & Co., of Pittsburg, and others who have given the matter practical attention.

It is certainly most desirable that armor plate production should be organized in the United States; but the conditions prescribed by the Naval Ordnance Bureau are such as to deter sagacious and experienced manufacturers from even considering the enterprise. The policy of the department in selecting for the protection of our ironclads a material discredited by the great maritime powers, and condemned in its own country, is in our opinion not only inconsistent with an intelligent study of European results, but antagonistic to domestic industry. Past experience of the fairness of the Bureau has been sufficiently discouraging, without offering to producers the chance of a new investment under conditions known on their face to be impracticable.

Had there been a want of specific information as to the most recent trials of solid steel armor in Europe—a circumstance hardly possible in view of the acknowledged employment of officers of our Navy by its manufacturer—the obviously proper course to determine the relative merits of armor would have been to invite European producers to submit plates for trial in this country. It is within our knowledge that some time since, the Sheffield manufacturers of compound plate proposed such a trial to the Navy Department, offering to furnish at the proving ground, without a penny of cost to the department, a plate from 12 to 20 inches thick, 10 to 12 feet long by 6 to 8 wide, to be fired at in competition with solid steel, only conditioned upon the detail of the firing being made public. The proposition has not received the formality of an acknowledgment.—*Army and Navy Jour.*

Does Consciousness Continue after Decapitation?

On the 31st of January, Mr. Hayem read an interesting communication before the French Academy of Sciences upon the effect of transferring the blood of the horse into the head of animals that have just been decapitated. He finds, in the first place, that when the head of a dog is suddenly severed from the body, the eyes for some time execute motions of anxiety, the jaws forcibly open and close, the eyes afterward become fixed, the nostrils dilate, the labial commissures contract, and the tongue contracts to the back of the mouth. A few seconds later, a few respiratory efforts are remarked, and finally the head becomes inert. These phenomena, as a whole, never last more than two minutes.

If, as soon as the decapitation has been effected, the carotids are put in communication with the cubital artery of a horse, the vital manifestations are observed to last for half an hour. Finally, if the transfusion is not effected until the head has become inert, the various vital manifestations mentioned above reappear, but definitely cease at the end of a few minutes.

Mr. Hayem concludes that the extinction of will and sensation is very rapid, if not immediate. Conscious life may, nevertheless, be prolonged for a moment by transfusion, when the operation is performed immediately after decapitation; but in the case of the recall to life of an inert head, nothing but automatic motions, without any trace of will, or consciousness even, can be perceived.

Analogous experiments had already been performed by the learned physiologist Brown-Sequard, who came to the conclusion that the will returns to the head of a dog freshly severed from the body. Since then, this opinion has been submitted to no sort of verification. The experiments of Mr. Laborde with human heads that had been severed from the body for over an hour were performed under conditions where success was an impossibility.

THE following are the dates of the introduction of railways in the various countries from 1825 to 1860:

England	Sept. 27, 1825
Austria	Sept. 30, 1828
France	Oct. 1, 1828
United States	Dec. 28, 1829
Belgium	May 3, 1835
Germany	Dec. 7, 1835
Island of Cuba	In the year 1837
Russia	April 4, 1838
Italy	Sept., 1839
Switzerland	July 15, 1844
Jamaica	Nov. 21, 1845
Spain	Oct. 24, 1848
Canada	May, 1850
Mexico	In the year 1850
Peru	In the year 1850
Sweden	In the year 1851
Chili	Jan., 1852
East Indies	April 18, 1853
Norway	July, 1853
Portugal	In the year 1854
Brazil	April 30, 1854
Victoria	Sept. 14, 1854
Colombia	Jan. 28, 1855
New South Wales	Sept. 25, 1855
Egypt	Jan., 1856
Middle Australia	April 21, 1856
Natal	June 26, 1860
Turkey	Oct. 4, 1860

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THE PANAMA CANAL WORKS.

The Panama Canal impresses the visitor as being one of the most gigantic engineering enterprises of modern times. Among the many difficulties to be overcome are those of taking the canal through the Chagres River some twenty times, through a hill several hundred feet high by means of a deep cutting, and through numerous swamps and beds of rock. When completed, it will be over fifty miles in length, twenty of which are now so far finished as to admit water, three miles having a depth of 25 ft. and the remaining seventeen a depth of 8 ft.

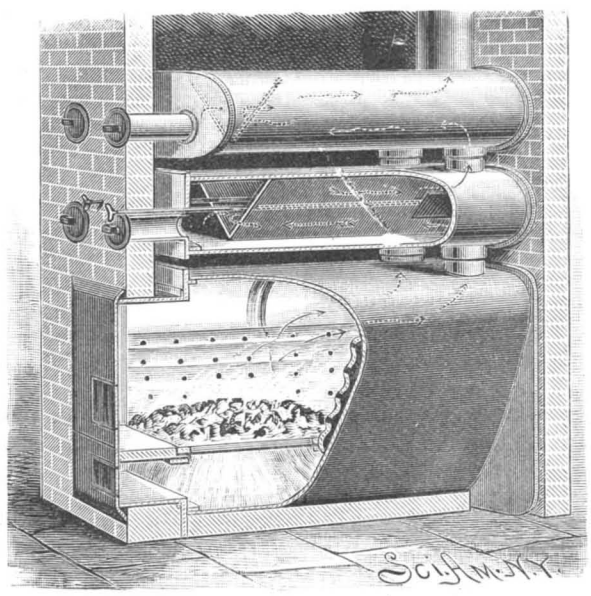
Among the sketches, the port of Colon, or Aspinwall, at once attracts attention, with its extensive wharves and sheds running out into the sea. Alongside these huge ships of all nations are so secured as to be ready "to slip" at short notice, in case of a gale coming on—a very necessary precaution, as not long ago seventeen large vessels were driven from their moorings and totally wrecked by the violence of a tropical storm. The sea there is never still, and to guard against its violence the entrance to the canal has been protected by a large breakwater run out into the sea, formed of concrete blocks, at the end of which is a large statue of Christopher Columbus, presented by the Empress Eugenie. At Mindi and other places are to be seen the bungalows of the engineers and workmen employed on the canal. These look beautifully clean and cool, and compare most favorably with the shanties of the negroes and Chinamen, who swarm about these parts.

The Cite de Lesseps—named after that illustrious Frenchman—is only a collection of huts, built of bamboos and any old refuse, and supported mostly on piles, often overhanging the muddy river, over swamps—in fact, anywhere. The canal cuts through the Chagres River there, and two large steam dredgers may be seen at work on the river discharging the dredged-up refuse far over the river's bank, through a long chute. Not only are there dredgers on the rivers, but on the land also, as at Las Cascadas, where a large locomotive dredger scoops up the earth and empties it into trucks the other side, by which it is taken away to form embankments, as at Bas Obispo.

Culebra presents a most animated scene—gangs of negroes, engines of novel construction in great numbers, all at work cutting through a hill some hundreds of feet high, through which the canal must pass. It is "man *versus* nature." With the exception of the engineers, negro labor only seems to be used, and as there is little sickness and good pay, the black man comes and works for a month or two, and then goes home and does nothing for the rest of the year. Wherever he is, he is always laughing, happy, and lazy. Our sketches and the above description are by Lieut. F. H. Boyer, R.N.—*London Graphic.*

HOT AIR FURNACE.

Above the furnace proper, or fire box, are placed radiators, the whole being inclosed by walls of brick. The furnace is made heart-shaped in cross section, so that the fire box is wider at the top than at the bottom, thus causing the fuel to settle together upon the grate bars as it burns away, the result being a better combustion. The walls of the furnace are stiffened by a casting, bolted to the inner surface, so that they will



PAINE'S HOT AIR FURNACE.

not warp or sag if overheated. The grate bars are supported upon cross pieces, one at the center and one at the forward end of the furnace. Back of the grate bars is a perforated plate. The space below the grate and plate forms the ash pit. The interior of the furnace above the grate and plate is lined with corrugated and perforated fire bricks, which are held a short distance from the furnace walls, so as to form air spaces which communicate with the ash pit. A circulation of air is thus maintained between the fire box and walls of the furnace to protect the latter from intense heat.

Just above the furnace is placed a radiator, elliptical in cross section, and divided into three longitudinal compartments by two partitions, so inclined as to make the central compartment V-shaped. The partitions are of less length than the radiator, and as they abut the back of the radiator a passage is formed between their front ends and the front of the radiator. The rear ends of the side compartments are connected by flues with the furnace, so that the current caused by the draught will be forced through the side chambers and back through the center one, and then through flue openings to the upper radiator, which is in all respects like the lower one, and the rear end of its center chamber is connected with the chimney flue. Connected to the front plates of the radiators are short pipes extending through the brickwork, and, provided at their outer ends with caps, by removing which the interiors can be cleaned.

In each partition of the lower radiator is an opening, closed by damper plates operated by rods leading to the front of the furnace. These openings are in line with the flues, so that when the dampers are opened, the draught will pass directly from the furnace to the upper radiator. The lower radiator may thus be thrown out of action when desired. By setting the radiator partitions at opposite inclinations, the heat is confined near the surfaces at both sides and at the top, thereby causing the radiator to give off the maximum amount of heat. The intense heat produced at the front by the meeting currents is largely given off through the front plates of the radiators. This reverberatory action causes the smoke to be consumed and effects a better utilization of the fuel.

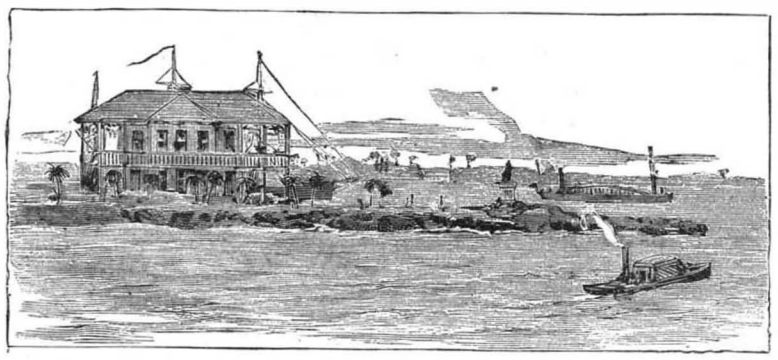
This invention has been patented by Mr. A. B. Paine, of Vermontville, Mich.

Through Suez at Night.

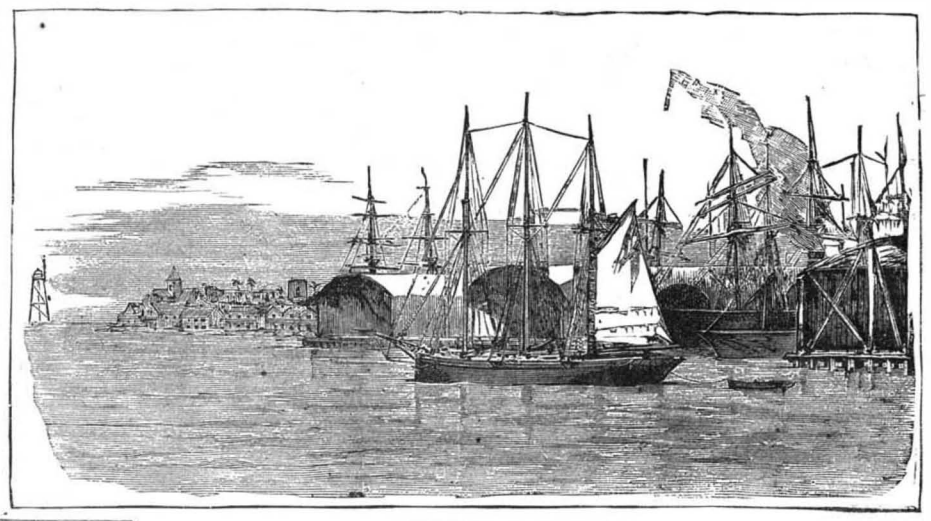
It is quite a common thing for a big steamer to go through the Suez Canal at night. But what is, perhaps, not generally known is that the steamer itself, and not the Suez Canal Company, has to supply the requisite electric light apparatus for the nocturnal passage. What the company does is to prescribe the amount of illuminating power which the apparatus must possess. For instance, no steamer is allowed to start on a night transit that is not fitted with an "electric projector" which is capable of throwing a light for at least 1,200 meters ahead. And on the upper deck, too, there must be an electric lamp and shade powerful enough to light a circular area some 600 meters in circumference. Big steamers are beginning to carry this apparatus, but there is a company both at Port Said and Port Tewfik which lets out the necessary projectors and lamps on hire.

Fidelity and Intelligence of the Dog.

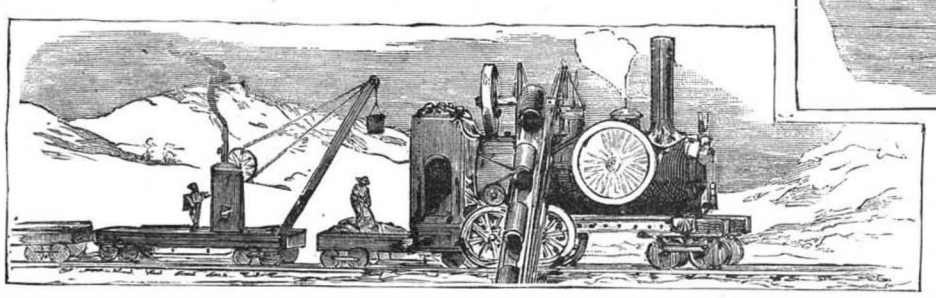
The New York *Sun* says: "A Missouri farmer, driving home at night from St. Louis, dropped a coat and a bag of oats from his wagon without knowing it. His dog knew it, though, and lying down by them watched them for three days, despite all efforts to coax or drive him away. At the end of that time the farmer came back. He said that he had been wondering what had become of his coat, bag, and dog, and hearing of a dog acting strangely on the road, came to see if it was his.',



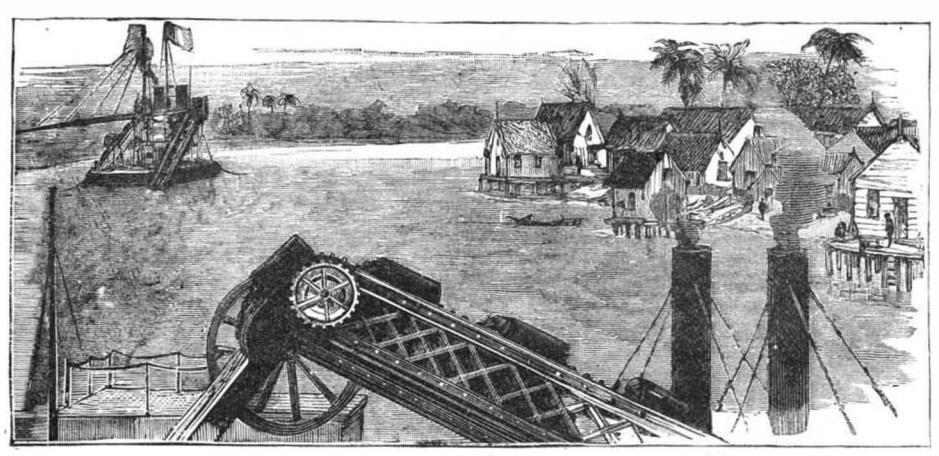
ENTRANCE TO THE CANAL AT COLON, AND STATUE OF CHRISTOPHER COLUMBUS



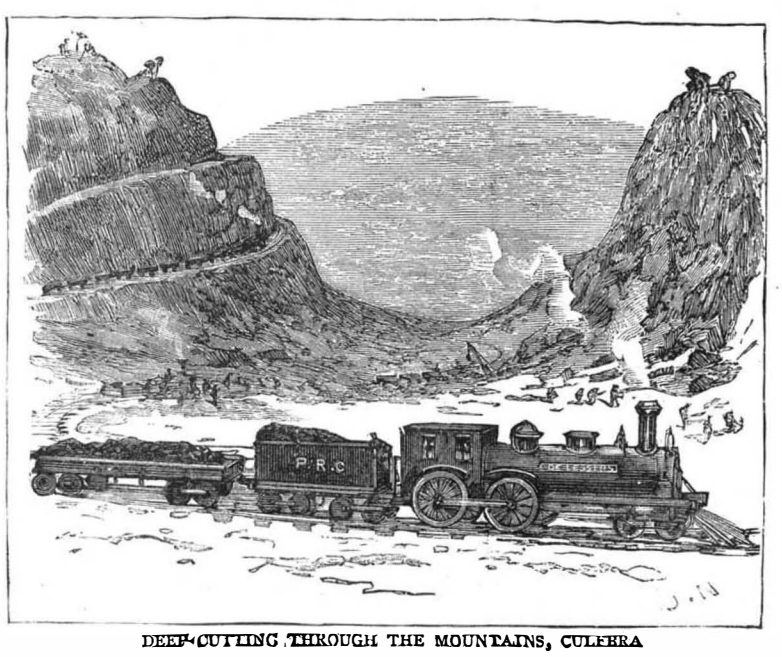
THE PORT OF COLON, OR ASPINWALL



LARGE LOCOMOTIVE DREDGER, LAS CASCADAS



CITÉ DE LESSEPS, WHERE THE CANAL FIRST CUTS INTO THE CHAGRES RIVER



DEEP CUTTING THROUGH THE MOUNTAINS, CULEBRA

VIEWS OF THE PANAMA CANAL WORKS FROM THE ISTHMUS RAILWAY.

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ENGINEERING INVENTIONS.

A muffler to prevent or lessen the disagreeable hissing sound caused by escaping steam has been patented by Mr. Thomas E. Hill, of Rahway, N. J. The invention covers a novel construction, combination and arrangement of parts, whereby the valves will permit the free escape of steam beyond the capacity of the boiler to generate it.

A metallic railway tie has been patented by Mr. Timothy Gleason, of Red Wing, Minn. It is cast or otherwise formed in trough shape, with flat bottom and vertical side pieces, and has cross pieces with a flange through which pass keys for supporting the fish plates, the upper surface of the bottom being formed with a crown, to strengthen the tie and prevent water from standing in it, with other novel features.

A railway crossing alarm has been patented by Mr Sterling P. Van Nort, of Manchester, Mo. All the rails upon either side of each section of the track in connection with which the alarm is arranged are placed in electric communication by means whereby pedestrians, teamsters, etc., will be notified at the crossing of a highway and railroad of the approach of a train, and after its passage the alarm will be automatically stopped.

A boiler tube cleaner has been patented by Mr. Charles F. Bower, of Philadelphia, Pa. A spider with three arms is made integral with a nozzle shell, and a deflecting plate connected to the spider has an external head, while there are means for supplying steam to the nozzle, so that its inclined peripheral face will bear hard against the end edges of the bore of the tube, and steam passing in will strike against the entire inner face of the tube.

AGRICULTURAL INVENTIONS.

A horse rake has been patented by Mr. James Dunkin, of Bridgeport, West Va. This invention covers a novel construction and arrangement of parts for a hay rake and carrier, intended to gather up the hay as it lies in the swath, load it into a carrier till it accumulates sufficiently, then carry it to place of storage and dump it.

A hay drag has been patented by Mr. William B. Null, of Evansville, Mo. It is provided on its main beam with runners, wheels, or supports, and has a supplemental runner, wheel, or support for the outer ends of the drag teeth, the construction being such that the drag can be readily transported from one place to another and may easily pass through gates.

MISCELLANEOUS INVENTIONS.

A loose belt alarm has been patented by Mr. Jacob Paff, of Amboy, Minn. A friction wheel is journaled on the pulley, with its periphery extending beyond that of the pulley, on which an alarm is mounted to be operated by the friction wheel, in such way as to indicate audibly the slipping of the belt.

A thill coupling has been patented by Mr. E. Lanson Dunklee, of Wyalusing, Pa. The invention covers certain novel features, whereby a thill coupling is made practically noiseless, and is very easily adjusted and reliable, not expensive, without danger of disengagement, and has a neat appearance on the running gear of a vehicle.

A fruit jar has been patented by Mr. Robert E. King, of Warrenton, N. C. It has a main or fruit chamber and a supplemental or sirup chamber, the chambers being connected by a contracted channel or opening, so the fruit will be prevented from passing into the sirup chamber, while the sirup may pass into the fruit chamber.

A pipe connection has been patented by Messrs. William E. Jones and Harry Winniatt, of El Paso, Texas. The invention consists of two pipe heads fastened together and turning on a spring bolt, with a packing placed between the pipe heads to prevent leakage, to permit swinging several connected pipe sections at angles to each other.

A gas lamp has been patented by Mr. Gustave H. Ulmann, of Paris, France. This invention provides a cylindrical regenerating chamber, with air inlets, and a series of conical tubes, for the escape of the products of combustion, whereby the air will be mixed with the gas in a way designed to produce a white and brilliant light, with a minimum consumption of gas.

A clothes line has been patented by Mr. James Cavanagh, of New York City. Combined with two pulleys attached to a window frame and a pulley attached to a post is a line passed over all the pulleys, to form specified angles and an open loop connection, whereby two full length lines are made available, and any slack can be easily taken up.

A holdback iron for wagon tongues has been patented by Mr. Augustus Smith, of Laurin, Montana Ter. The invention covers a novel construction of a device for the ends of wagon tongues, which will prevent the neck yoke from escaping in case of accident to the harness, the yoke being easily removable when desired.

A vehicle wheel has been patented by Mr. William C. Hodnett, of Douglasville, Ga. It is composed of a tire made of two semicircular pieces of metal, spokes, and a central metal sectional hub, the semicircular sections of tire being connected by splice plates and bolts, and the spokes being easily removable from their sockets, with other novel features.

An apparatus for drying malt has been patented by Mr. William S. Plummer, of Rochester, N. Y. It consists of a revolving drying floor, twenty to forty feet in diameter, suitably supported, with a series of movable or adjustable wickets, provisions for the forcible application of heated air and for the discharge of the malt, with other novel features.

A drag saw support and guide has been patented by Mr. John R. Van Winkle, of Aberdeen, Washington Ter. It is a roller support, with a main bar made in two jointed sections, a clamping device at the joint, one section having dogs for attachment to a log and the other carrying a support and guide for the back of a saw blade, making a simple device for facilitating the undercutting of logs.

A cartridge extracting implement has been patented by Mr. Clarence R. Hart, of Sioux City, Iowa. It consists in a pair of jaws pivoted to a bowed spring and having a ratchet bar and catch for holding them in position, making a combination tool in which the jaws are adapted at one end to receive the flanged end of a cartridge and at the opposite end to act as tweezers for handling small objects.

A whiffletree coupling has been patented by Mr. Albert Hensser, of Taylor, Nevada. The invention covers certain novel features of construction and combination of parts for a coupling calculated to be strong, durable, cheap, and effective, and adapted also to be used in coupling bolsters to head blocks of vehicle running gear, and for other purposes where a strong, non-rocking, pivoted connection is required.

A thread guard for cap spinning and twisting machines has been patented by Mr. Leedham Binns, of Philadelphia, Pa. The guards are made of partly circular form at their backs, and peculiar shape at their front edges, where they are made to interlock with one another, with other novel features, the design being to prevent the several yarns from interfering or entangling with each other when being spun and twisted.

A machine for splicing wire hoops for barrels, etc., has been patented by Mr. James H. Bard, of Jackson, Tenn. This invention covers novel constructions and combinations of mechanism, in which the ends of the wire are made with a lock that consists of a bend and a coil of the extremities of the wire loosely fitting upon each side of the bend, with or without a space between the two coils for a spacing sleeve or wedge.

SCIENTIFIC AMERICAN
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2. Elegant Colored Plate of a Dwelling at Orange, N. J., costing $5,000; with plans of floors in colors, sheet of details, elevations, etc., 12 figures, specification, etc.
3. The American School of Classical Studies at Athens. Half page engraving.
4. Page Drawing of a Country Dwelling in brick, costing $5,000, with floor plans.
5. Perspective Drawing of St. Andrew's Church, Phenix, R. I., of moderate cost, with specification and floor plan.
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7. Elevations and floor plans of a Cottage costing $1,000.
8. An Ornamental Entrance Porch. Half page engraving.
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10. Perspective and floor plans for a Summer Hotel, two pages.
11. Two pages showing Stark's Design in perspective of proposed Monument to General Grant, New York, with plans.
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13. Drawing of the Pulpit, Church of the Holy Cross.
14. Design for an Ornamental Gate.
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16. Perspective drawing of an English Country House.
17. Miscellaneous Contents: Floors and Ceilings, Ancient and Modern. By E. Powell Carr, Consulting Architect, New York; a valuable paper.—Useful Hints on House Building.—Shingles in Modern Architecture.—Diamond Point Nail Set.—Adjustable Wood Measuring Rack.—Redwood Logging.—Grano-Metallic Stone.—Black Birch.—Maple Flooring.—Water Tight Roofs.—Slate Roofs.—A Small Ice House, illustrated.—Mineral Wool as a filling for floors and walls, illustrated.—The use of mortar during frost.—Practical remarks on House Painting, exterior and interior.—Corrugated Iron Ornamental Ceilings, illustrated.—Together with a variety of other interesting articles and illustrations, too numerous to mention; and a Compendium of Manufacturers' Announcements, illustrated by upward of one hundred engravings.

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The 9th edition (22d thousand) of "Trautwine" appeared in March, 1885. It was larger than its immediate predecessor by over 150 pages, the new index alone being more than twice as large as that of the 8th edition. Many of the old articles were modernized, and many new ones added. The present edition contains still further improvements.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) L. L. & X. ask: 1. In the Atlantic cable, how is the circuit completed? A. By ground circuit, a condenser being used at one or both ends. 2. How is a break in the cable detected, and how located? A. If a fault in insulation, by determining the resistance and comparing it with that of the whole cable; if a breakage in the conducting wire, by determining the electrostatic capacity as compared with that of the entire cable. Either of these comparisons fixes the point.

(2) W. B. B. asks: 1. Can I electrify my body so that on shaking hands with some person, it will produce a shock if a circuit is formed with a chloride of silver battery, as described in SUPPLEMENT, No. 157? A. By using an induction coil or a spark coil you can arrange a wire circuit so as to shock as described. 2. Could I work a set of telegraph instruments a half mile or less? How many will it take on each end? A. Five or six chloride of silver cells would work a half mile telegraph line. This number at each end would give an excellent working current.

(3) A. M. S. asks for the process of liquefying nitrous oxide gas and oxygen gas so as to compress 100 gallons into cylinders, as it is put up for dental use and oxygen treatment. A. Nitrous oxide is liquefied by pressure. It is pumped into cylinders until the pressure reaches about fifty atmospheres, when it liquefies and continues to do so as long as it is pumped in. Oxygen cannot be liquefied except by special processes, such as Cailletet's or Pictet's. It is used in the oxygen treatment from cylinders into which it is pumped under heavy pressure, but in which it never leaves the gaseous form. The apparatus can be bought from dealers in scientific apparatus.

(4) E. McD. asks: How can I prepare a liquid such as is used in grenades, etc., for extinguishing fires, to be used with a hand force pump? A. The liquid consists of sodium chloride, ammonium chloride, and hydrochloric acid dissolved in water with the addition of potassium carbonate, and subsequently sodium bicarbonate, and last of all a little free crystallized tartaric acid. See the answer given to query 7 in SCIENTIFIC AMERICAN for February 7, 1885, also recipes in Spons' "Workshop Receipts," second series, which we can send you for $2.00, post paid.

(5) F. A. B. writes: In hardening our goods, we have been using iron pots to hold the lead in which we bring the articles to a hardening heat. The result is that the iron pots will only stand the necessarily intense heat for a few days, then give way in the bottom, and the lead runs into the fire. Can you tell us of any material that will be durable, of which to have our pots made? Say size 12 inches by 8 inches by 4 inches. Would a crucible work well, and if so, how could it be best supported in the fire? A. A plumbago crucible resting upon a fire brick will be durable. We recommend an oval or round shape, with slightly rounded bottom. Set these on three fire bricks standing on end, which will give support and prevent too strong fire on the bottom.

(6) W. J. D. asks: What is the difference between a tornado and a cyclone, and from what authorities? A. The word tornado is used to indicate any wind of extreme violence, from 90 to 120 miles an hour. The word cyclone is properly used to denote whirlwinds, which in the northern hemisphere rotate in direction opposed to that of the hands of a watch. The Cyclopedias, Haswell, and Ganot all speak of the subject.

(7) G. H. McC. asks: 1. What is the copper colored paint used to paint the bottoms and water lines of fresh water yachts and vessels? A. Essentially it is oxide of copper with tar and a solvent. The composition is a secret. 2. Will it get soft under water? A. No. 3. Is there any way to prevent weeds and moss from growing on the bottoms of small yachts? A. Use verdigris or approved copper paint, or coat with bronze powder and copal varnish.

(8) J. P. asks: Can a locomotive start a greater weight than itself, on the track, providing there is no play between the couplings? A. The power of a locomotive is largely in excess of the requirement of starting a given load, of many times its own weight, by a dead pull. The play of the couplings only becomes of value in excessively heavy and long trains. The engine's hold on the rails depends on sliding friction. The resistance of the cars outside of inertia depends principally on rolling friction. The latter is far less for a given weight than is the first.

(9) G. B. T. asks why, in listening to an echo, one can only hear the last part of a sentence. A. The last words of the speaker drown the echo of the first words, which is returning while one is speaking. Daniell's Physics treats the kinetic theory very thoroughly. We mail it for $4.

(10) S. S. S. asks (to decide a bet) the proper door to open and the door to shut, after lighting the fire, to insure proper draught and combustion, in starting a fire in the furnace of a regular heating boiler. A. The question is one which cannot be fully

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answered by simply saying one or the other, or by a yes or no, as is sometimes the case in a question on which a wager is pending. Such disputes usually arise from a misunderstanding, or a difference in statement of the terms, rather than in a variance of opinion as the actual question at issue. Fires are started both ways, with the ash pit door or with the furnace door open, according as the fire is laid, the attention to be given it and the time. Ordinarily a fire under a boiler should, if possible, be lighted on top of the kindling material, so that the first combustion shall be perfect to start the draught. The top door should be open that the fresh air may reach the flame and prevent dense smoke. When the kindling wood is well on fire, open the lower door a little way to clear the smoke from the ash pit and establish a draught through the grating. Then put on coal and shut the upper door, opening the lower door enough to keep the fire bright. With a little management in this way a fire may be started under a house heating boiler without filling the house with smoke. In starting a fire under the grate, with the ash pit door open, the fuel must be more carefully laid to insure a draught to start with, and the intial progress is then frequently accompanied with puffs of smoke.

(11) H. R. F. asks what chemicals, if there are any, will separate tannic acid from gelatine, also what will dissolve common tanned leather? A. It is one of the first illustrations frequently employed in the study of chemistry, that tannic acid and gelatine make a chemical, and not a mechanical, compound, and become an insoluble one. The gelatine and tannic acid cannot be recovered back from such compound; nor can tannic acid, fibrine, and gelatine, of which tanned leather is made, be ever brought back to their orignal condition after being once made into leather. There are some adherents in Germany of a theory that tanning is a mechanical and not a chemical combination, but it has never been proved. A great difficulty with the subject lies in the fact that there is much difference in the action and power of combination of the tannins obtained from different substances, for reasons which are not understood; the tannin from gambier, valonia, sumac, etc., can be washed out of a skin to a certain extent in a way which cannot be accomplished when the tanning is done with oak or hemlock bark.

(12) R. G. P. asks how many Grenet batteries it will take to run a boat 20 ft. long by 4 ft. 4 in. beam, and 21 in. deep, and how many miles an hour. A. About 3,000 ordinary sized Grenet cells would be required to develop a speed of 6 to 7 miles an hour. If you want to use batteries, you need special large sized low-resistance cells, and of these far fewer would be needed, say 350 cells.

(13) T. E. writes: We have a barge sunken; her decks are tight, but 24 feet below the surface of the river. In pumping her out, please tell me which will require least power—to pump the water above the decks, and discharge it 23 feet below the surface, or to pump it above the surface of the river? A. The same power will be required, assuming the water to be discharged exactly at the surface level in the second case supposed. If discharged above the surface, the extra height represents extra power.

(14) L. L. asks how frozen glue is made, such as is used by leather manufacturers. A. Frozen glue is what its name denotes. The glue while gelatinous is sliced, placed on nets and allowed to freeze by natural cold. Of course the process can only be conducted in cold weather. The product is porous and much more bulky than hard glue, but is a better article, as it dissolves more easily. It sells largely in New England, where it is preferred by buyers to the hard glue.

(15) J. H. P. asks: 1. The kind of iron and the mixture for making malleable iron. A. No. 5 and 6 iron mixed, or scrap and No. 6. 2. The best kind of scale to put in the annealing cans, and how long should it take to anneal a round piece, say one-half inch thick. A. Forge scales or pulverized hematite, anneal 4 to 6 days at red heat. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 399, "Malleable Iron Castings."

(16) M. E. P., Kentucky, asks: Is there any means of patching or resilvering mirrors, which I could do at home? A. Clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove any trace of dust or grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking-glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance as a new one.

(17) G. H. W., Waterville, Me., asks: 1. How can I remove tincture of iron stain from a cotton fabric, and indelible ink stain from linen? A. Use dilute hydrochloric acid in order to remove the iron stain, and javelle water or some of the hypochlorites for the ink stain. See "Table for Removal of Stains and Grease Spots," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(18) W. G. McC., Lake Forest, Ill., asks how to make a white ink. A. For writing on black or dark paper, use the finest or lightest zinc or white lead in a weak solution of gum arabic or dextrine. For writing on blue paper, tinted with ultramarine, use a solution of oxalic acid.

(19) A. M., Lowell, Mass., wants the manner or process of curling feathers worn on ladies' bonnets. A. When the curl has come out by washing the feather or getting it damp, place a hot flat iron so that you can hold the feather just above it while curling. Take a bone or silver knife, and draw the fibers of the feather between the thumb and the dull edge of the knife, taking not more than three fibers at a time, beginning at the point of the feather and curling one-half the other way. The hot iron makes the curl more durable.

(20) A. C. M. asks: Will two cells of Grenet battery (size of zincs 2½ by 4¾ in.) have sufficient power to run a one candle power electric lamp? A. Four cells would be necessary to give satisfactory results.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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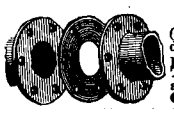

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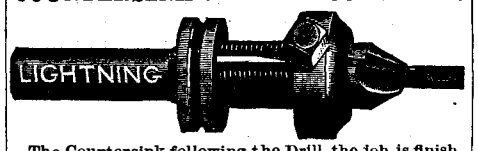

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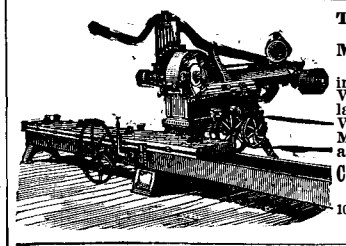

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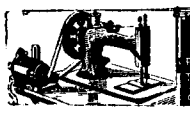

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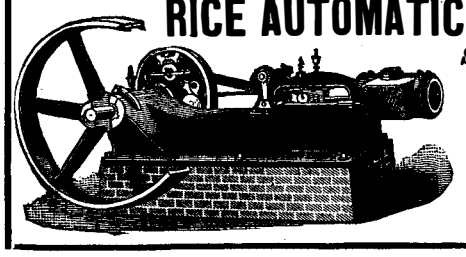
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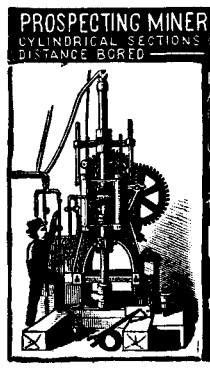
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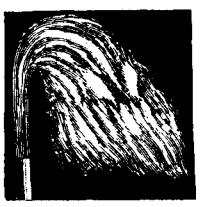
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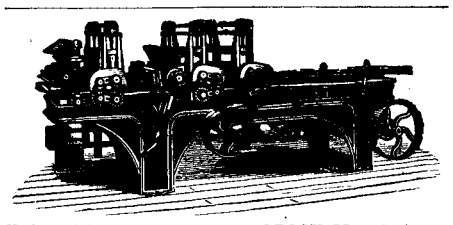
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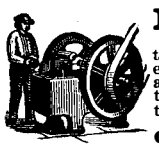
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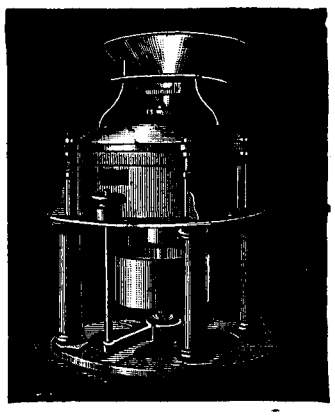
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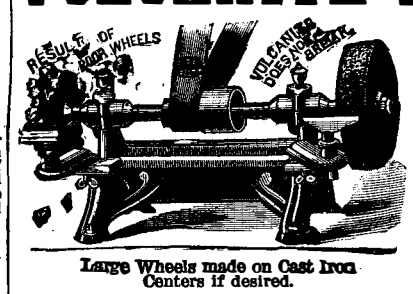

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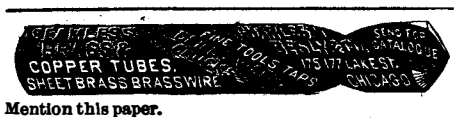

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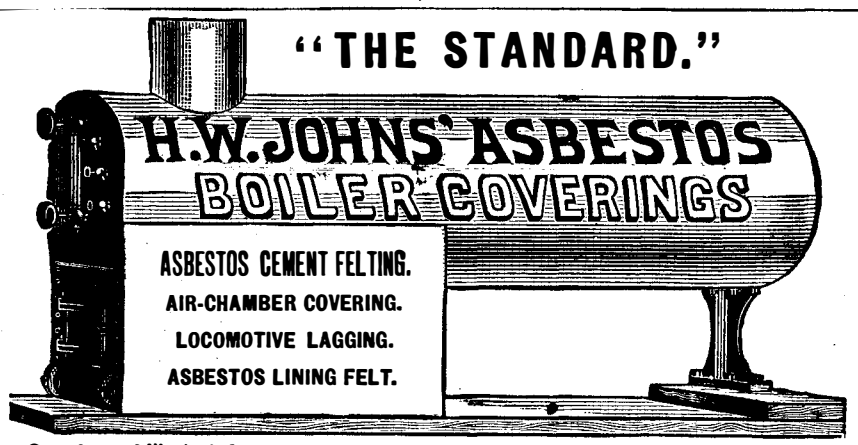

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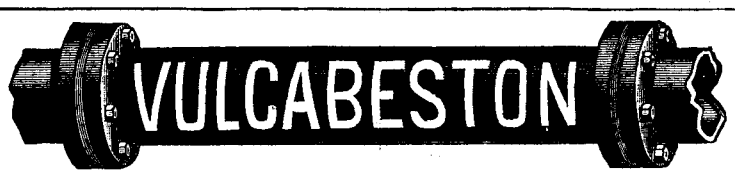

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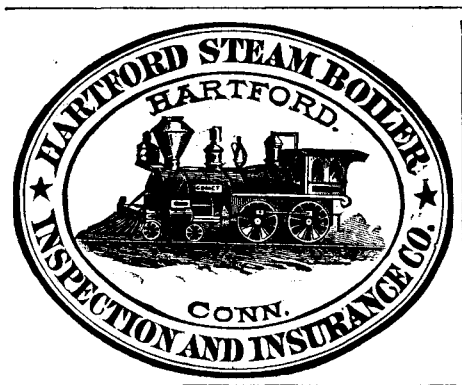

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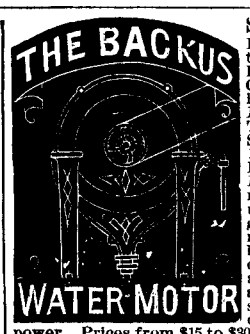

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